VOL. 6 NO. 18
September 30, 1981

Energy Research Abstracts

ABSTRACTS 26734-28027

Technical Information Center
UNITED STATES DEPARTMENT OF ENERGY

CURRENT AWARENESS PUBLICATIONS ON ENERGY

To provide complete coverage of literature related to major Department programs, announcement publications which are comprehensive in their coverage of certain energy fields are issued regularly. All information in these publications, plus additional backup information, is included in the energy data base of the Technical Information Center; all references are also available for machine searching via the on-line retrieval system, DOE/RECON. Descriptions of these current awareness publications, which are supported either directly or indirectly by the DOE, appear below.

PUBLICATIONS OF THE TECHNICAL INFORMATION CENTER

Energy Abstracts for Policy Analysis (EAPA)

A monthly abstract journal devoted to the analysis of energy research, conservation, and policy. Scope and coverage are limited to substantive articles or reports and emphasize the following: programmatic efforts; legislative, regulatory, and other legal aspects; social, economic, and environmental impacts; regional and sectoral analyses; institutional factors, etc. *EAPA* is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402; domestic subscribers $4.00, foreign $5.00 per copy; annual cumulative index, domestic $6.00, foreign $7.50 per copy. The annual subscription price is $44.00 for domestic subscribers and $55.00 for foreign subscribers.

Energy Research Abstracts (ERA)

A comprehensive semimonthly abstract journal devoted to all areas of energy-related information produced by the Department of Energy, other U. S. government organizations, and foreign governments. Indexes are cumulated semiannually and annually. *ERA* is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues including a semiannual index and an annual index is $184.00 for domestic subscribers and $230.00 for foreign subscribers. The semiannual and annual indexes will also be available separately to subscribers. The cost for the semiannual index is $18.00 (domestic) or $22.50 (foreign); the annual index is $33.00 (domestic) or $41.25 (foreign). A single issue costs $5.55 (domestic) or $6.95 (foreign).

The following publications are available to the public on a subscription basis from the National Technical Information Service (NTIS), Springfield, Virginia 22161. The annual subscription rate for one volume (calendar) year (12 issues plus cumulative index) is $45.00 for domestic subscribers and $90.00 for subscribers outside the North American Continent. A single issue is $6.00 (domestic) and $12.00 (outside the North American Continent).

Current Energy Patents (CEP)

A monthly publication providing abstracting and indexing coverage of the international patent literature, including patent applications, that concerns any aspect of energy production, conservation, and utilization. Available as PB81-902800.

Energy Conservation Update (ECU)

A monthly abstract journal devoted to current information on energy conservation in buildings, transportation and propulsion, and industry; waste processing plants and equipment; energy storage; energy conversion; advanced automotive systems; combustion systems; power cycles; synthetic fuels; and power transmission. Available as PB81-914800.

Energy and the Environment (EAE)

A monthly abstract journal devoted to information on the impacts of energy-related activities and radioactive and nonradioactive pollutants on the environment. Available as PB81-914900.

Fossil Energy Update (FEU)

A monthly abstract journal devoted to information on the processing and use of fossil fuels. Available as PB81-914600.

Fusion Energy Update (CFU)

A monthly abstract journal devoted to information on controlled thermonuclear research. Available as PB81-915300.

Geothermal Energy Update (GEU)

A monthly abstract journal devoted to information on the exploration and development of geothermal resources. Available as PB81-914700.

Solar Energy Update (SEU)

A monthly abstract journal devoted to information on the utilization of solar, tidal, and wind energy. Available as PB81-914500.

Synthetic Fuels Update (SFU)

A monthly abstract journal devoted to information on coal gasification; coal liquefaction; other coal processing; biomass conversion to fuel; shale oil and tar sand bitumen production; hydrogen fuels; other hydrocarbon fuels; alcohol fuels; and inorganic hydrogen compound fuels. Available as PB81-902700.

INTERNATIONAL ENERGY PUBLICATIONS

Atomindex (Published in cooperation with the Technical Information Center by the International Atomic Energy Agency, International Nuclear Information System, Vienna, Austria)

A semimonthly abstract journal devoted to information on nuclear science and technology. Through an exchange agreement, IAEA/INIS provides all non-U. S. nuclear information of *Atomindex* to TIC for inclusion in the DOE/RECON Data Base; in turn, TIC provides all U. S. nuclear information to IAEA/INIS for inclusion in *Atomindex*. *Atomindex* is available by subscription from UNIPUB, 345 Park Avenue South, New York, NY 10010. The cost of an annual subscription, 24 semimonthly issues and semiannual and annual cumulative indexes, is $290.

Coal Abstracts (Published in cooperation with the Technical Information Center by the International Energy Agency, IEA Coal Research, London, England)

A monthly abstract journal devoted to information on coal. Through an exchange agreement, IEA Coal Research provides all non-U. S. coal information of *Coal Abstracts* to TIC for inclusion in the DOE/RECON Data Base; in turn, TIC provides all U. S. coal information to IEA Coal Research for inclusion in *Coal Abstracts*. *Coal Abstracts* is available to Department of Energy components and contractors from the Technical Information Center. Non-DOE organizations may obtain *Coal Abstracts* from IEA Coal Research, Technical Information Service, 14-15 Lower Grosvenor Place, London SW1W 0EX, England, for 100 pounds sterling per year.

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ERRATA

Vol.	Issue	Replace Bibliographic Citation with:
5	15	**23998** (DOE/ET/27025–1) **Geothermal Energy Market Study on the Atlantic Coastal Plain. Geothermal Energy Market penetration: development of a model for the residential sector.** Goodman, A.C. (Johns Hopkins Univ., Baltimore, MD (USA). Center for Metropolitan Planning and Research). Sep 1979. Contract EX-76-A-36-1008. 37p. NTIS, PC A03/MF A01.
6	6	**7882** (ORNL/SUB–7321/3) **Demonstration of a heat pump water heater. Volume 1. Design report.** Sloane, B.D.; Krise, R.C.; Kent, D.D. (Energy Utilization Systems, Inc., Pittsburgh, PA (USA)). Dec 1979. Contract W-7405-ENG-26. 68p. NTIS, PC A04/MF A01.
6	6	**8487** (ORNL/TM–7296) **Fusion energy division computer systems network.** Hammons, C.E. (Oak Ridge National Lab., TN (USA)). Dec 1980. Contract W-7405-ENG-26. 13p. NTIS, PC A02/MF A01.
6	10	**13759** (SAND–80-1964/6(Rev.)) **Midtemperature solar systems test facility predictions for thermal performance based on test data: Acurex solar collector with glass reflector surface.** Harrison, T.D. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 25p. NTIS, PC A02/MF A01.
6	10	**15001** (DOE/ER/10459–12) **Inter-subband optical absorption in an inversion layer on a semiconductor surface in tilted magnetic fields. Progress report, July 1, 1980-June 30, 1981.** O'Connell, R.F. (Louisiana State Univ., Baton Rouge (USA). Dept. of Physics and Astronomy). 1981. Contract AS05-79ER10459. 8p. NTIS, PC A02/MF A01.
6	11	**15262 Surface coal mining and reclamation symposium (Coal conference and Expo V).** New York. NY; McGraw-Hill, Inc. (1979). 326p. (CONF-7910117(Vol.1)).
6	11	**15299** (SAND–80-2784) **Techniques for determining the leaching and oil fill schedules for the strategic petroleum reserve (SPR).** Shefelbine, H.C. (Sandia National Labs., Albuquerque, NM (USA)). Feb 1981. Contract AC04-76DP00789. 84p. NTIS, PC A05/MF A01.
6	12	**16370** (DOE/OR/13402–T1) **Creep of monolithic refractory materials. Final report.** McGee, T.D.; Smyth, J.R.; Bray, D.J. (Iowa State Univ. of Science and Technology, Ames (USA). Engineering Research Inst.). Nov 1980. Contract AS05-78OR13402. 50p. (ISU-ERI-AMES–81402). NTIS, PC A03/MF A01.
6	13	**18305** (SAND–80-2557) **Analytical models for solar-photovoltaic energy-system components.** Edenburn, M.W. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 147p. NTIS, PC A07/MF A01.
6	13	**18372** (SERI/TR–721-907(Conf. Ver.)) **Trade-off between collector area, storage volume, and building conservation in annual-storage solar-heating systems.** Sillman, S. (Solar Energy Research Inst., Golden, CO (USA)). Apr 1981. Contract AC02-77CH00178. 7p. (CONF-810509–24). NTIS, PC A02/MF A01.

Vol.	Issue	Replace Bibliographic Citation with:
6	14	**20468** (SAND–81-8210) **Method for determining D-xylose in copper-plating solutions.** Feemster, H.C. (Sandia National Labs., Livermore, CA (USA)). Apr 1981. Contract AC04-76DP00789. 10p. NTIS, PC A02/MF A01.
6	14	**20686** (SAND–79-1823) **Block floating-point notation for signal processes.** Simpson, J.E. (Sandia National Labs., Albuquerque, NM (USA)). Mar 1981. Contract AC04-76DP0789. 22p. NTIS, PC A02/MF A01.

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ENERGY RESEARCH ABSTRACTS

ABOUT THE TECHNICAL INFORMATION CENTER

The Technical Information Center, as the national information center for the Department of Energy, manages, publishes, and disseminates scientific, technical, and practical energy information acquired from worldwide sources. It builds and maintains energy information data bases used to prepare abstracting journals, bibliographies, and literature searches. The data bases are also searchable via the Department's on-line retrieval system, DOE/RECON. This information is provided to DOE program offices and contractors; scientists; engineers; educational, commercial, and industrial communities; and the general public. The Technical Information Center conducts an active announcement and marketing program. It establishes policy and administers control of an inventory and registry for DOE publications. The Center also develops and evaluates new and effective information systems and services as required by scientific and technical management within the Department of Energy.

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Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports, journal articles, conference papers and proceedings, books, patents, theses, and monographs originated by the U. S. Department of Energy, its laboratories, energy centers, and contractors. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations. The user should remain aware that *ERA* coverage of non-report literature is limited to that generated by Department of Energy activity.

ERA is comprehensive in its subject scope, encompassing the DOE's research, development, demonstration, and technological programs resulting from its broad charter for energy sources, conservation, safety, environmental impacts, and regulation.

ERA is available on an exchange basis to universities, research institutions, industrial firms, and publishers of scientific information. Federal, state, and municipal agencies concerned with energy development, conservation, and usage may obtain *ERA* free of charge. Inquiries should be directed to the Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.

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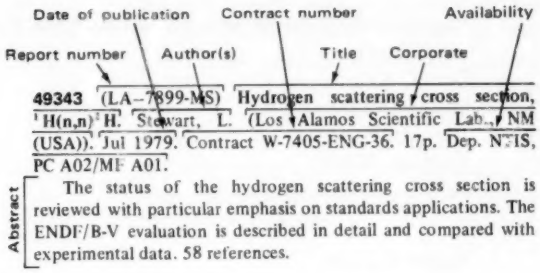
The principal elements of abstract entries for a typical research and development report and a typical technical journal article are illustrated below.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Contract number
Availability
Report number
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Title
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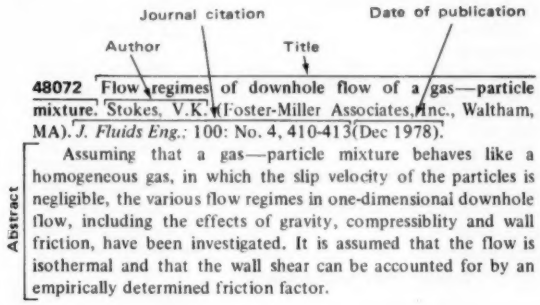
49343 (LA–7899-MS) Hydrogen scattering cross section, $^1H(n,n)^1H$. Stewart, L. (Los Alamos Scientific Lab., NM (USA)). Jul 1979. Contract W-7405-ENG-36. 17p. Dep. NTIS, PC A02/MF A01.
Abstract
The status of the hydrogen scattering cross section is reviewed with particular emphasis on standards applications. The ENDF/B-V evaluation is described in detail and compared with experimental data. 58 references.


Journal citation
Date of publication
Author
Title
48072 Flow regimes of downhole flow of a gas—particle mixture. Stokes, V.K. (Foster-Miller Associates, Inc., Waltham, MA). J. Fluids Eng.; 100: No. 4, 410-413 (Dec 1978).
Abstract
Assuming that a gas—particle mixture behaves like a homogeneous gas, in which the slip velocity of the particles is negligible, the various flow regimes in one-dimensional downhole flow, including the effects of gravity, compressiblity and wall friction, have been investigated. It is assumed that the flow is isothermal and that the wall shear can be accounted for by an empirically determined friction factor.

•INDEXES TO *ENERGY RESEARCH ABSTRACTS*

Five indexes are provided for approaching the contents of each issue of *Energy Research Abstracts (ERA)*. These indexes are cumulated semiannually and annually. Each index is preceded by an introduction that details the organization of the index and the principles by which it was compiled. The reader is referred to these introductions for information not found in the index examples that follow.

•Corporate Index

Technical report literature is indexed using the name of the organization or institution responsible for the issuance of the report.

49343 (LA–7899-MS) Hydrogen scattering cross section, $^1H(n,n)^1H$. Stewart, L. **(Los Alamos Scientific Lab., NM (USA))**. Jul 1979. Contract W-7405-ENG-36. 17p. Dep. NTIS, PC A02/MF A01.

is indexed as:

Los Alamos Scientific Lab., NM (USA)
Advanced laser fusion target fabrication research and development proposal, 4:48249 (LA–7619-P)
Hydrogen scattering cross section, $^1H(n,n)^1H$, 4:49343 (LA–7899-MS)

•Author Index

Each author's name is indexed in the form appearing on the document abstracted, with the exception that given names are reduced to initials:

Stewart, L., Hydrogen scattering cross section, $^1H(n,n)^1H$, 4:49343 (LA–7899-MS)
Stewart, M.D., *See* McInroy, J.F., 4:49280
Stewart, W., *See* Dean, J.W., 4:48543
Stimson, J., Reproduction, growth, and survival of Enewetak corals, 4:49200 (NVO–0703-1, pp 56-59)

•Subject Index

The subject index consisting of entries naming specific materials, objects, and processes is arranged alphabetically. Document titles and informative phrases, or both, specific to these entries are arranged alphabetically under the entries.

HYDROGEN I TARGET
Neutron Reactions
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Research Programs
Inventory of advanced energy technologies and energy conservation research and development: 1976-1978. Volume II. Prepared for the Committee on Science and Technology, U.S. House of Representatives, 96*th* Congress, 4:48749.

•Contract Number Index

DOE technical report literature is indexed using contract numbers. This index contains the contract number with corresponding abstract and report numbers.

W-7405-ENG-36	**Los Alamos Scientific Lab., NM (USA)**	
	3:49698	LA-tr–78-45
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W-7405-ENG-48	**California Univ., Livermore (USA). Lawrence Livermore Lab.**	
	3:49386	UCRL–52456
	3:49431	UCRL–52405

•Report Number Index

Technical report literature is also indexed using report numbers. This index includes information on where individual reports may be obtained. Patents and conference papers are indexed here as a matter of convenience.

LA-		
7899-MS	4:49343	Dep. NTIS, PC A02/MF A01
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SUBJECT CONTENTS (NUMERICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts*. The following listing includes the totality of the 40 first-level and 294 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope notes is available as DOE/TIC-4584-R4 from NTIS for $7.00.

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26734 (ORNL—5773) Fossil Energy Program. Quarterly progress report for the period ending March 31, 1981. McNeese, L.E. (Oak Ridge National Lab., TN (USA)). Jun 1981. Contract W-7405-ENG-26. 323p. NTIS, PC A14/MF A01. Order Number DE81024271.

This quarterly report covers the progress made during the period January 1 through March 31 for the Oak Ridge National Laboratory research and development projects that are carried out in support of the increased utilization of coal and other fossil fuels as sources of clean energy. These projects are supported by various parts of DOE including Fossil Energy, Basic Energy Sciences, Office of Health and Environmental Research, Office of Environmental Compliance and Overview, Economic Regulatory Administration, Policy and Evaluation, Resource Applications, by the Electric Power Research Institute, and by the Tennessee Valley Authority and the EPA Office of Research and Development through interagency agreements with the DOE.

26735 (ORNL/TM—7826) Fossil Energy Program. Progress report for April 1981. McNeese, L.E. (Oak Ridge National Lab., TN (USA)). Jun 1981. Contract W-7405-ENG-26. 114p. NTIS, PC A06/MF A01. Order Number DE81023866.

This report - the eighty-first of a series - is a compendium of monthly progress reports for the ORNL research and development programs that are in support of the increased utilization of coal and other fossil fuel alternatives as sources of clean energy. The projects reported this month include those for coal conversion development, chemical research and development, materials technology, component development and process evaluation, technical support to major liquefaction projects, process analysis and engineering evaluations, fossil energy environmental analysis, flue gas desulfurization, coal preparation waste utilization, atmospheric fluidized bed coal combustor for cogeneration, TVA FBC demonstration plant program technical support, PFBC systems analysis, fossil fuel applications assessments, performance assurance system support for fossil energy projects, international energy technology assessment, and generalized equilibrium models for liquid and gaseous fuel supplies.

26736 (ORNL/TM—7865) Fossil energy program. Progress report for May 1981. McNeese, L.E. (Oak Ridge National Lab., TN (USA)). Jul 1981. Contract W-7405-ENG-26. 124p. NTIS, PC A06/MF A01. Order Number DE81027140.

This report - the eighty-second of a series - is a compendium of monthly progress reports for the ORNL research and development programs that are in support of the increased utilization of coal and other fossil fuel alternatives as sources of clean energy. The projects reported this month include those for coal conversion development, chemical research and development, materials technology, component development and process evaluation, technical support to major liquefaction projects, process analysis and engineering evaluations, fossil energy environmental analysis, flue gas desulfurization, coal preparation waste utilization, atmospheric fluidized bed coal combustor for cogeneration, TVA FBC demonstration plant program technical support, PFBC systems analysis, fossil fuel applications assessments, performance assurance system support for fossil energy projects, international energy technology assessment, generalized equilibrium models for liquid and gaseous fuel supplies, and analysis of coal production.

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26737 (CONF-8005172—1) Corrosion and stress corrosion cracking in coal liquefaction processes. Baylor, V.B.; Keiser, J.R. (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 56p. NTIS, PC A04/MF A01.

From Canadian council of ASM conference on materials to satisfy the energy demand; Harrison, UK (11 May 1980).

The liquefaction of coal to produce clean-burning synthetic fuels has been demonstrated at the pilot plant level. However, some significant materials problems must be solved before scale-up to commercial levels of production can be completed. Failures due to inadequate materials performance have been reported in many plant areas: in particular, stress corrosion cracking has been found in austenitic stainless steels in the reaction and separation areas and several corrosion has been observed in fractionation components. In order to screen candidate materials of construction, racks of U-bend specimens in welded and as-wrought conditions and unstressed surveillance coupons were exposed in pilot plant vessels and evaluated. Failed components were analyzed on-site and by subsequent laboratory work. Laboratory tests were also performed. From these studies alloys have been identified that are suitable for critical plant locations. 19 figures, 7 tables.

26738 (DOE/ET/10104—7) Solvent Refined Coal (SRC) process. Selected physical, chemical, and thermodynamic properties of narrow boiling range coal liquids for the SRC-II process. Interim report, March 1980-February 1981. Gray, J.A. (Gulf Science and Technology Co., Pittsburgh, PA (USA). Chemical and Minerals Div.). Apr 1981. Contract AC05-76ET10104. 224p. NTIS, PC A10/MF A01. Order Number DE81025929.

Physical, chemical, and thermodynamic properties of coal liquids as a function of boiling range via the pseudocomponent approach are needed for process design now that various direct coal liquefaction processes are being scaled to semi-commercial size. Products from the SRC-II processing of a high volatile bituminous coal were distilled into narrow boiling fractions with average boiling points ranging up to 969°F. Fractions boiling below 750°F typically spanned a 50°F interval, while the others were slightly wider boiling and overlapped somewhat. Liquid density, thermal conductivity and viscosity were measured at temperatures to 450°F, and specific heat was determined at temperatures near the boiling point of each fraction. Other property determinations included molecular weight, pour point, elemental analyses, water content and solubility and hydrocarbon types. Both organic oxygen content and water solubility showed a pronounced maximum for the fraction having an average boiling point of 384°F. This fraction showed anamolous density and thermal conductivity behavior. A secondary distillation on six different fractions spaced over the entire boiling range yielded heart cuts spanning 8 to 46°F that were used for measurement of surface tension, heat of vaporization and vapor pressure at temperatures to 900°F. Property data for all the fractions are compared with other published data and existing property correlations.

26739 (DOE/ET/10152—T6) H-coal process improvement study: bench unit baseline run with preheater/reactor. (Hydrocarbon Research, Inc., Lawrenceville, NJ (USA)). May 1981. Contract AC05-77ET10152. 56p. (FE—10152-65). NTIS, PC A04/MF A01. Order Number DE81026022.

Under DOE Contract DE-AC05-77ET-10152, HRI is investigating the thermal dissolution of coal and its effects on the mechanism of coal liquefaction in an H-Coal system. The two-stage coal liquefaction system consists of a coal slurry preheater which is essentially a short residence time reactor and a liquefaction reactor which can be regarded as a catalytic-hydrogenation-reactor. HRI designed the preheater and installed it in the bench unit which will be used for all the studies in this program. The preheater design and unit modifications are discussed. The objective of the run reported here was to obtain baseline data with the preheater integrated in the bench unit system. The results are compared with those of previous bench runs at similar operating conditions without a preheater, and also to previous PDU operations at similar conditions. These comparisons were made to determine what effect a preheater has on product yields and product quality. Based on comparing data from this single experimental run to estimates from previous runs extrapolated to the same conditions by correlations, we conclude a preheater tends to increase heavy liquid yields with more residual oil and a higher proportion of heavy distillates in the distillate product. However, more experimental data at comparable operating conditions, with and without a preheater, are needed to confirm this observation.

26740 (DOE/ET/10154—T9) Evaluation of liquid-phase prilling as a technique for SRC solidification. (Catalytic, Inc., Wilsonville, AL (USA)). Jun 1981. Contract AC01-76ET10154. 27p. (FE—2270-80). NTIS, PC A03/MF A01. Order Number DE81025638.

A process for solidifying solvent refined coal (SRC) by injecting molten material into a column of water was developed by E.I. duPont de Nemours and Company, Inc. It was tested in a series of short, pilot-scale experiments using a column 78 mm (3 in.) in diameter and a maximum of 3.05 m (10 ft) high. The program was too limited to yield a definitive evaluation of the SRC prilling system, but it did establish, within experimental limits, the technical feasibility of the process concept. Catalytic, Inc. conducted an engineering evaluation of the DuPont test results and developed a preliminary estimate of process costs for a prilling module sized to solidify 3400 tons of SRC per day. Catalytic's findings, summarized in this report, were that, while the process advantages contemplated by DuPont are probably valid, there are offsetting disadvantages which must be evaluated carefully before further effort is committed to process development.

26741 (DOE/ET/10328—33) Coal-hydrogasification process development. Quarterly technical progress report, April 1-June 30, 1981. Combs, L.P.; Breese, L.S.; Patel, N.J.; Garey, M.P.; Lee, W.T. (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). Jul 1981. Contract AC01-78ET10328. 36p. NTIS, PC A03/MF A01.

Principal IPDU-related activities concerned advance procurement of components and equipment for eventual facility construction and the addition of a benzene recovery loop to the product gas system. Relatively large orders for the liquid hyrogen pumping system, the microprocessor controller, lock hopper valves, and severe-service letdown valves were worked on by the suppliers and all are approaching delivery. Orders were placed for some items on the advance procurement list which had been deferred due to funding limitations. Equipment specifications and envelope control drawings were prepared for components needed for the benzene recovery loop. Facility design modifications to accommodate this system addition are being worked upon. Development of a computer code for modeling the fluid mechanics, particle dynamics, and coal pyrolysis chemistry within an entrained flow coal FHP reactor was continued. Most of the effort was devoted to: incorporating the expanded coal particle pyrolysis and chemical kinetic reaction model into the entrained flow reactor model; modifying the numerical solution method to one more suitable for the expanded set of model differential equations; debugging the computer code; and evaluating computer run options for most reliable and economical computation. Attention was also directed to comparing conversions calculated by the new FHP reactor model with experimental conversions from ten selected hydrogasification and hydroliquefaction tests having a broad range of reactor residence times.

26742 (DOE/ET/10584—T1) New process for producing carbon monoxide and hydrogen. Final technical report on Grant EF77G-012732. Sloan, E.D. (Colorado School of Mines, Golden (USA)). Nov 1980. Contract FG01-77ET10584. 16p. NTIS, PC A02/MF A01.

The kinetics of phosphorus pentoxide with carbon have been studied in a fixed bed of activated carbon at temperatures between 925 and 1050°C, and at 1 atm pressure. Phosphorus pentoxide vapors were passed into the reactor with helium as a carrier gas. Principal products were carbon monoxide and phosphorus. Data acquisition was using both the differential and integral techniques. The effects of changes in particle size and density were studied. The reaction rate was found to be first order with a resulting activation energy of 45.1 Kcal/mole. The data indicated a chemical reaction controlled mechanism in the entire range of temperature with mass transfer and diffusion effects being small.

26743 (DOE/ET/12103—T1) Development of new catalysts for coal-liquids refining. First quarterly report, 1 January 1979-31 March 1979. (Filtrol Corp., Los Angeles, CA (USA)). Apr 1979. Contract AC22-78ET12103. 37p. (FE—2595-1). NTIS, PC A03/MF A01. Order Number DE80000211.

Two existing hydrotreating units were redesigned to increase their operating range, and the necessary parts ordered. A new microactivity testing (MAT) unit was designed, and the parts ordered. Base-line testing procedures were improved, and the effect of unit parameters on catalytic activity was studied with borrowed Filtrol testing units. Synthesis and characterization of various catalytic components and matrix modifications was carried out. Sodium-Y zeolites with different silica-alumina ratios and different crystal sizes are being synthesized. Synthetic montmorillonite micas (SMM) in the ammonium (SMM-NH_4) form have been prepared with silica-alumina ratios from 2.16 to 2.58, and cation exchanged with Co and Ni. Lattice-substituted SMM (SMM-M) have been prepared on a laboratory scale with Ni^{2+}, Co^{2+}, and Fe^{3+} substituted for Al^{3+} in the octahedral coordination position. A series of relatively large pore size alumina supports with varying pore size distributions, and good strengths, have been prepared. These alumina supports have been made into hydrotreating catalysts by impregnation with different concentrations of CoO/MoO_3 and NiO/MoO_3.

26744 (DOE/ET/12103—T3) Development of new catalysts for coal-liquids refining. Second quarterly report, 1 April 1979-30 June 1979. Schwager, I. (Filtrol Corp., Los Angeles, CA (USA)). Jul 1979. Contract AC22-78ET12103. 56p. (FE—2595-2). NTIS, PC A04/MF A01. Order Number DE80000213.

Construction of the new microactivity testing unit is about 25 percent completed. The final design changes for the improved hydrotreating and hydrocracking test units were completed, and the reactors and exit gas-liquid separators are being fabricated. Base-line testing conditions for hydrotreating the SRC-II Fuel Oil Blend were determined with commercial hydrotreating catalysts. A wide range of hydrotreating conditions was studied: temperature (650 to 800°F), pressure (400 to 1500 psig), H_2 flow rate (2000 to 15,000 SCF/bbl), and LHSV (0.5 to 3 ml/ml-hr). An insignificant amount of thermal cracking of SRC-II Fuel Oil Blend, and hydrotreated SRC-II was observed between 900 to 1000°F in a standard microactivity testing unit. Catalytic cracking with a commercial FCC catalyst afforded low levels of conversion with untreated SRC-II feed, but with hydrotreated SRC-II, 63 to 67 wt. % conversion, and a gasoline range product fraction of from 67 to 58% by weight could be obtained over the temperature range from 900 to 1000°F. Synthesis and characterization of various catalytic components was carried out. Cation exchange of these materials is proceeding. Pilot plant batches of amorphous silica-alumina and silica-alumina-magnesia have been prepared. Exploratory cracking, hydrocracking, and hydrotreating catalysts are being produced in preparation for activity testing.

26745 (DOE/FE/20223—1) Low/medium btu coal gasification assessment program for specific sites of two New York utilities. Executive summary. (Department of Energy, Washington, DC (USA). Assistant Secretary for Fossil Energy). Dec 1980. Contract FG01-79RA20223. 31p. NTIS, PC A03/MF A01. Order Number DE81027682.

The scope of this study is to investigate the technical and economic aspects of coal gasification to supply low- or medium Btu gas to the two power plant boilers selected for study. This includes the following: select a coal based on its availability, mode of transportation and delivered cost to each power plant site; investigate the effects of burning low- and medium-Btu gas in the selected power plant boilers based on efficiency, rating and cost of modifications and make recommendations for each; review the technical feasibility of converting the power plant boilers to coal-derived gas; identify coal gasification systems that are compatible with the selected coals; have proven pilot, demonstration, or commercial plant operating experience; and produce a product gas which is compatible with the fuel requirements of the power plant; review the technical feasibility of designing a coal gasification facility to meet the constantly changing fuel demands of a power plant; select a low- or medium-Btu coal gasification system for study at Arthur Kill Power Plant; select a low- or medium-Btu coal gasification system for study at Oswego Power Plant; identify gas cleanup systems that are available and compatible with the coal gasification systems, and one capable of reducing the total sulfur emission levels to that required by environmental regulations; select a gas cleanup system for use with the selected coal gasification systems; review the regulatory and financial aspects of conversion to a coal-derived gas; prepare capital cost estimates in 1980 dollars for each of the coal gasification systems; prepare capital cost estimates in 1980 dollars for the boiler modifications; and perform economic evaluations for each of the synthetic gas-fired options, and compare them to the case of continued oil-firing.

26746 **(DOE/NASA/2593—28) High-temperature alkali corrosion in high-velocity gases.** Lowell, C.E.; Sidik, S.M.; Deadmore, D.L. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). May 1981. Contract AI01-77ET10350. 33p. (NASA-TM—82591). NTIS, PC A03/MF A01. Order Number DE81025839.

The effects of potential impurities in coal-derived liquids such as Na, K, Mg, Ca, and Cl on the accelerated corrosion of IN-100, U-700, IN-792, and Mar-M509 were investigated using a Mach 0.3 burner rig for times to 1000 hours in 1-hour cycles. These impurities were injected in combination as aqueous solutions into the combustor of the burner rig. The experimental matrix utilized was designed statistically. The extent of corrosion was determined by metal recession. The metal recession data were fitted by linear regression to a polynomial expression which allows both interpolation and extrapolation of the data. As anticipated, corrosion increased rapidly with Na and K, and a marked maximum in the temperature response was noted for many conditions. In contrast, corrosion decreased somewhat as the Ca, Mg, and Cl contents increased. Extensive corrosion was observed at concentrations of Na and K as low as 0.1 ppM at long times.

26747 **(DOE/PC/30027—9) Recycle slurry-oil characterization. Quarterly report No. 2, January 1-March 31, 1981.** Burke, F.P.; Winschel, R.A. (Conoco Coal Development Co., Library, PA (USA). Research Div.). Jun 1981. Contract AC22-80PC30027. 52p. NTIS, PC A04/MF A01. Order Number DE81025230.

Our intention in this work is not simply to provide analytical data, but to utilize the measurements of recycle slurry and process oil characteristics to provide assistance for evaluating the relationship between coal liquid properties and process performance. Areas of process performance to be investigated include but are not limited to the following: changes in the slurry recycle and process oil stream compositions during start-up; the manner in which the process reaches steady state operation during start-up; the composition of the recycle and process oil streams during stable operation; the changes in recycle oil composition in response to planned variations in process variables; changes in recycle oil compositions which cause or result from unplanned upsets in process operation; differences in recycle and process oil compositions as a function of process operating conditions; and differences in recycle and process oil compositions as a function of process feed materials.

26748 **(DOE/TIC—1025764) Coal-gasification instrumentation program (PR 11734). Quarterly progress report, April 1, 1981-June 30, 1981.** (Los Alamos National Lab., NM (USA)). 6 Jul 1981. Contract W-7405-ENG-36. 24p. NTIS, PC A02/MF A01. Order Number DE81025764.

In the laser-induced breakdown spectroscopy (LIBS) approach increasing the pressure of most gases to ten atmospheres resulted in a much larger white-light background signal and concomitantly broadened atomic emission lines, resulting in a loss of resolution. In the present study, we demonstrated that time-resolved LIBS (TRELIBS) data taken after a few microseconds delay time both obviated the background light and regained the spectral sharpness enjoyed at lower pressures. Coherent anti-Stokes Raman spectroscopy (CARS) is a promising spectroscopic technique for on-line, real-time diagnostics of species concentrations and temperature in the gas-streams of coal gasifiers. Our present work is directed toward the development of an appropriate data base for CARS of several constituents of coal-gasifier streams, both separately and mixed, under laboratory conditions of pressures up to 1000 psi and temperatures up to 500 K, with emphasis upon detection of trace concentrations of certain minority species. Laboratory determination of minority species detectability is meaningful only if performed subject to constraints imposed by coal gasifiers. In our initial work on the use of infrared absorption spectroscopy for the analysis of coal gasifier product gases, it was shown that for 1 to 2 mm path lengths, absorption bands of the major species CO, CO_2, CH_4, and H_2O were distinguishable at moderately high pressure (1000 psi) and temperature ($\sim$ 220°C). The concentrations of these species were determined by comparison with appropriate reference spectra. Subsequent experiments have been aimed at developing infrared absorption methods for detecting minor species COS, SO_2, H_2S, SO_3, N_2O, NO, NO_2, and NH_3 in the presence of the major species.

26749 (EPRI-WS—79-238(Vol.1), pp Section 6, 6.1-6.27) **Exxon Donor Solvent coal liquefaction process: development program status III.** Epperly, W.R.; Plumlee, K.W.; Wade, D.T. (Exxon Research and Engineering Co., Florham Park, NJ). May 1981. NTIS, PC A18/MF A01.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

The status of the Exxon Donor Solvent Coal Liquefaction Process Development Program is reviewed. Included in the overview of this government-industry cost-shared development is a description of Exxon's integrated approach to the project. The status of the laboratory and engineering research and development studies along with an up-to-date status of the 250 T/D large pilot plant operation, Test Program and a 70 T/D FLEXICOKING prototype program will be presented. The process description includes discussions of coal feed flexibility and product flexibility. Potential product utilization schemes, including direct utilization and various conventional upgrading routes, are surveyed. The project environmental program philosophy and studies are described. The economic outlook for the EDS process and the effects of various bases are presented, concluding with consideration of the prospects for commercialization. The prospects for successfully developing coal liquids technology are good with the programs presently in place, but the prospects and timing for an economically attractive coal liquids industry are uncertain. Project activities are directed toward achieving commercial readiness for EDS. Successful operation of the ECLP pilot plant is a high priority activity this year, and a continuing effort on process improvements will be made in an effort to reduce the cost of synthetic liquids. The project will also continue to focus attention on bottoms processing, a critical step in the development.

26750 (EPRI-WS—79-238(Vol.1), pp Section 7, 7.1-7.20) **Current status of H-Coal commercialization.** Eccles, R.M.; DeVaux, G.R. (Hydrocarbon Research, Inc., Lawrenceville, NJ). May 1981. NTIS, PC A18/MF A01.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

H-Coal is a direct catalytic hydroliquefaction process for converting coal into high quality, clean liquids. The process uses the ebullating-bed reactor to achieve superior distillate yields in the range of 40 to 50 weight percent from a wide variety of coals. The process has been thoroughly and successfully tested in laboratory

equipment at coal capacities up to 3.5 tons per day. Over recent months, H-Coal operating experience has been obtained at the 600 ton-per-day plant at Catlettsburg, Kentucky. Two major commercial plant design studies are underway for potential operators both in the US and abroad, and additional feasibility studies are being proposed. HRI's experience with H-Coal extends to nearly 20 coals, and economic studies suggest that the H-Coal syncrude mode operation is a front-runner in terms of lowest liquefaction product cost.

26751 (EPRI-WS—79-238(Vol.1), pp Section 8, 8.1-8.21) **Coal hydrogenation plant at Bottrop.** Specks, R.; Langhoff, J.; Woloski, E.; Escher, G. May 1981. NTIS, PC A18/MF A01.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

Ruhrkohle AG/Veba Oel AG have a 200 t/d-pilot plant for coal liquefaction under construction in Bottrop, Northrhine-Westphalia. Construction work was started in May 1979. Completion and commissioning of the plant is scheduled during the first quarter of 1981. The coal oil obtained from the Bottrop pilot plant will be processed in a semi-commercial plant at Veba Oel AG, Scholven. Investigations on coal oil from a laboratory plant at Bergbau-Forschung GmbH, Essen are already being carried out. The following targets have been set for the pilot plant of Bottrop: plant operation in order to demonstrate the expected improvements (already confirmed on a laboratory scale) achievable by the German Technology versus the coal hydrogenation plants operated up to 1945; optimization of the entire process; testing and improving of plant components; and logging of basic data permitting the lay-out of commercial plants. The German Technology is based on the process developed by Bergius and Pier (IG-process) modified by introducing process steps and equipment according to the most recent state of technology. Compared to the previous IG-technology, the operational pressure was brought down from 700 to 300 bar utilizing the same cheap iron catalyst, i.e., red mud. For preparing the feed slurry, medium/heavy oil produced by distillation during the process is used in a ratio of 40:60 instead of the former thin centrifuge liquid. This prevents asphaltene enrichment in the coal slurry. The residue is to be used at commercial plants for hydrogen production by gasification.

26752 (EPRI-WS—79-238(Vol.1), pp Section 9, 9.1-9.61) **Cost comparisons of alternative routes for converting SRC-II oil-to-distillate fuels.** Sullivan, R.F.; O'Rear, D.J.; Stangeland, B.E.; Frumkin, H.A. May 1981. NTIS, PC A18/MF A01.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

The net whole liquid process product from the SRC-II coal liquefaction process (SRC-II syncrude) was refined in pilot plant facilities at Chevron Research Company using advanced commercial petroleum processing technology to produce distillate fuels: gasoline, kerosene jet fuel, diesel, and heating fuel. Six alternate refining routes were evaluated, each involving hydrotreating at one of several severities, followed by either hydrocracking or fluid catalytic cracking when further reduction of boiling point was needed. SRC-II syncrude presents unusual refining problems. It is notable for high nitrogen and oxygen contents and is composed mainly of cyclic compounds. The key to the successful refining of SRC-II syncrude is an effective initial hydrotreating step. This removes the contaminants, increases the hydrogen content, and permits the use of conventional hydrocracking or fluid catalytic cracking for further conversion. Refining costs were estimated for each of the six processing routes based on producing 50 MBPCD of transportation or heating fuels from a grass roots refinery, that is, a complete new refinery which includes all of the necessary supporting facilities, such as utility plants, tankage, and required environmental control equipment. In addition, a number of variations on the six basic cases were explored. Typical yields of finished products ranged from 88 to 91 liquid volume percent of feed. Refining costs to various fuels were $10 to $16 per barrel of product depending on the product slate and certain other factors which are discussed.

26753 (EPRI-WS—79-238(Vol.1), pp Section 10, 10.1-10.30) **SRC-II demonstration project.** Freel, J.; Jackson, D.M.; Schmid, B.K. (Pittsburg and Midway Coal Mining Co., Englewood, CO). May 1981. NTIS, PC A18/MF A01.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

A 6000 T/D demonstration plant to produce liquid fuels from high-sulfur bituminous coal by the SRC-II process is now being designed. The total cost of the project, estimated to be about 1.5 billion dollars, will be shared between the United States Department of Energy, the governments of West Germany and Japan, and Gulf Oil Corporation. The governments of West Germany and Japan will each contribute 25% of the total cost, while Gulf will contribute up to 100 million dollars. The remainder of the project cost will be borne by the United States Department of Energy. The primary contract for design, construction, and operation of the plant has been assigned to a joint venture company consisting of P and M, Ruhrkohle and Veba of Germany, and Japan SRC-II, a Japanese corporation in which Mitsui Inc. is the principal firm. The SRC-II demonstration plant will produce fuel oil for use in boilers and turbines, naphtha suitable as reformer feedstock to make high octane gasoline, and by product light hydrocarbons, from West Virginia coal. Design work is proceeding and is expected to be completed in early 1983. The major effort thus far has been to finalize the process design, so that subsequent detailed engineering can proceed. Experimental work is being pursued at the Fort Lewis pilot plant to confirm certain process features which have not yet been tested at that scale. Work is also proceeding on site acquisition, arrangements for a supply of feed coal and arrangements for product sales. A draft environmental impact statement has been issued and is now being revised.

26754 (EPRI-WS—79-238(Vol.1), pp Section 11, 11.1-11.13) **Saarberg coal liquefaction developments.** Wuerfel, H.E. (Saarbergwerke AG, Saarbruecken, Germany). May 1981. NTIS, PC A18/MF A01.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

The Saarberg coal liquefaction process is a further development of proven IG-Farben technology. The main differences are a lower pressure, reduced hydrogen consumption and improved preheating of the coal slurry achieved by mixing oil partially condensed from hot separator vapors to the slurry. The new method dispenses with indirect heat transfer elements for preheating the slurry. Thus a better availability and thermal efficiency of a coal liquefaction plant can be achieved. These improvements will be demonstrated in a 6 t/d pilot plant which is now ready for operation.

26755 (EPRI-WS—79-238(Vol.1), pp Section 12, 12.1-12.27) **SRC-I coal refining demonstration plant.** Morris, S.M.; Foster, E.P. (International Coal Refining Co., Allentown, PA). May 1981. NTIS, PC A18/MF A01.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

The International Coal Refining Company, a joint venture between Air Products and Chemicals, Inc. and Wheelabrator-Frye Inc., is engineering, constructing, and will operate the SRC-I Coal Refining Demonstration Plant. This Department of Energy and industry sponsored 6000 ton/day facility should be among the first large-scale coal liquefaction projects to be completed in the US. The plant will be designed to permit much operating flexibility, particularly in the yield and quality of products. Solid fuels, light and heavy liquid fuels, and coke will be produced over a wide range of product specifications to be used in a number of industrial and utility operations. Following a demonstration period, the plant will be expanded fivefold to product a nominal 100,000 bbl/day of products from 30,000 tons/day of coal.

26756 (EPRI-WS—79-238(Vol.1), pp Section 13, 13.1-13.19) **Rheinbraun liquefaction of brown coal.** Boecker, D.; Lenz, U.; Dolkemeyer, W.; Keim, K.H. May 1981. NTIS, PC A18/MF A01.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

In the HVB process, liquefaction of brown coal is carried out in two stages. In the first stage, viz. the sump-phase hydrogena-

tion, dry brown coal is converted into coal oil. In the second stage, viz. the gas phase hydrogenation - comprising the steps of syncrude refining, hydrocracking, naphtha reforming - the syncrude from brown coal is converted into feed materials for the chemical industry and/or into salable motor fuels. After catalytic reforming of heavy naphtha (80 to 180°C) the combined total gasoline fraction has a research octane number of 97 and is considered to be premium gasoline even without leading. Due to the properties of the HVB process products, viz. high contents of paraffins and naphthenes in the refined gasoline and middle oil, high content of aromatic substances in the reformed heavy naphtha, it is possible to produce the essential basic chemicals of organic chemistry, viz. olefines and aromatic BTX substances, from brown coal. Tests on steam cracking of refined brown coal naphtha and middle oil have shown that compared to corresponding fractions from petroleum there is no difference to be expected in the yield of olefines. Thus, the products from hydroliquefaction of brown coal can be used as a substitute for petroleum in both the motor fuel sector and petrochemical sector without any adaptation of the present demand structures in both sectors becoming necessary.

26757 (EPRI-WS—79-238(Vol.1), pp Section 14, 14.1-14.15) **Dow coal liquefaction process update.** Moll, N.G.; May, V.T.; Quarderer, G.J.; Stuart, G.A. May 1981. NTIS, PC A18/MF A01.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

In this paper we have described a number of the unique features of the Dow Coal Liquefaction Process. Parts of this technology may be of specific interest to developers of other liquefaction processes. Taken as a whole, the Dow technology fits together to provide an integrated efficient process. Our primary present objective is to provide test results at larger scale to prove the usefulness of the integrated process as well as the component parts. We would welcome the opportunity to talk with any interested parties regarding this technology. While the Dow Process today is clearly related to past developments, it incorporates novel features. Briefly these developments are: an expendable catalyst, fed as a component of the coal slurry, which is effective at a 100 ppM addition level in the feed; a mechanically simple catalytic reactor; the use of hydroclones to provide partial solids removal from the major component of the recycle oil and to provide partial recycle of catalyst to the reactor; the use of Dow-developed, solvent-deasphalting technology to produce an essentially solids-free, low-sulfur product oil and a high solids concentrate suitable for gasifier feedstock; and an integrated gasification scheme based in part on Dow developed gasification technology. Together these features represent an advanced, versatile, and efficient process for coal conversion which combines simplicity of design with high thermal efficiency.

26758 **(FE—3046-T5) Two-stage coal liquefaction process. Quarterly report, July 1-September 30, 1979.** Kang, C.C. (Catalysis Research Corp., Palisades Park, NJ (USA)). 15 Oct 1979. Contract ET-78-C-01-3046. 21p. NTIS, PC A02/MF A01.

Further evaluation of the macropore catalysts, which have median pore diameters of 2350, 4000, 8800, 12,000 and 15,000 Angstrom have confirmed the previous observation that the macropore catalysts with 2350, 4000, and 8800 Angstroms pores and same pore volume as HDS-1442A, 0.7 cc/g., are capable of higher coal conversion and higher 975°F$^+$ toluene-insoluble residuum conversion than HDS-1442A. Runs carried out at four temperature levels, 780, 810, 830, and 850°F establish that the catalyst with 8800 Angstrom pores maintains higher coal conversion and high 975°F$^+$ toluene-insoluble residuum conversion than HDS-1442A at all these four operating temperatures.

26759 **(ORNL/FMP—81/2) AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.** (Oak Ridge National Lab., TN (USA)). Jul 1981. Contract W-7405-ENG-26. 380p. NTIS, PC A17/MF A01. Order Number DE81026061.

This is the second combined quarterly progress report for those projects that are part of the Advanced Research and Technology Development (AR and TD) Fossil Energy Materials Program. The work described in this report covers the period from January 1, 1981 to March 31, 1981. The objective of the Program is to conduct a program of research and development on materials for fossil energy applications with a focus on the longer-term and generic needs of the various fossil fuel technologies. The program includes research aimed toward a better understanding of materials behavior in fossil energy environments and the development of new materials capable of substantial enhancement of plant operations and reliability. Materials used in coal liquefaction, combustion systems, and coal gasification are included. Separate abstracts of individual reports have been prepared for inclusion in the Energy Data Base. (DMC)

26760 (ORNL/FMP—81/2, pp 225-228) **Development and application of nondestructive test methods for coal conversion and utilization systems.** Youngdahl, C.A.; Ellingson, W.A.; Sullivan, J.; Reimann, K.J. (Argonne National Lab., IL). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

Highlights of current activities are summarized of 3 tasks associated with the development of non-destructive testing methods. The purpose of task 1 is to develop a nondestructive acoustic system to detect internal leakage post valves for lock-hopper and dry ash letdown service and block valves. The purpose of task 2 is to develop techniques for the acoustic emission sensing to detect crack formation in thick refractory concrete linings of the type envisioned for full-scale coal gasification processes. The third task involves developing reliable on-line, high-temperature ultrasonic systems to measure erosive wear.

26761 (ORNL/FMP—81/2, pp 283-292) **Design, engineering, and evaluation of refractory liners for slagging gasifiers.** Bortz, S.A. (IIT Research Inst., Chicago, IL). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

The objectives of the program are: (1) to determine the rate of wear of refractory liner system under conditions simulating actual conditions in slagging gasifiers and to develop models for life prediction; (2) to develop design practices and specifications for refractory liners in large slagging gasifiers which can perform for at least two years with only routine annual maintenance; and (3) to prepare a liner design handbook which will communicate the results of this program to gasifier designers and users. Highlights of progress accomplished during the past quarter are summarized.

26762 (ORNL/TM—7612, pp 12-40) **Coal liquefaction.** Jul 1981. NTIS, PC A09/MF A01.

In Advanced research and technology development fossil energy materials program plan for FY 1981.

Four direct liquefaction processes have reached the pilot plant stage: Exxon Donor Solvent process, H-Coal, SRC-I, and SRC-II. Materials problems common to all the processes are discussed for the coal and slurry preparation systems, preheater and reactor systems, pressure letdown and separation systems, fractionation systems, and auxiliary and support systems. (DLC)

26763 (ORNL/TM—7612, pp 41-98) **Coal gasification.** Jul 1981. NTIS, PC A09/MF A01.

In Advanced research and technology development fossil energy materials program plan for FY 1981.

Several coal gasification processes (fixed-bed, fluidized-bed, entrained, and molten-bath) are being developed and are described: Lurgi, General Electric, Morgas, slagging Lurgi, Exxon, Hygas, U-Gas, Westinghouse, Texaco, Shell-Koppers, Koppers-Totzek, Bigas, C-E, Foster-Wheeler, Atomics International, and Kellog. Generic materials problems are discussed for the coal preparation and feed systems, gasifiers, gasifier internals, and gas cleanup system and shift converter. 56 references, 14 figures. (DLC)

26764 **(SAND—81-0716C) Product yield and hydrogen consumption selectivity tests for coal-liquefaction-catalyst development.** Stephens, H.P. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 6p. (CONF-810813—1). NTIS, PC A02/MF A01.

From National American Chemical Society summer meeting; New York, NY, USA (23 Aug 1981).

Because hydrogenation of coal to liquid products (oils) is accompanied by distributions of complex by-product mixtures (IOM, preasphaltenes, asphaltenes and gases) which change as a function of reaction variables (time, temperature and pressure) and reactor configuration, the determination of selectivity relationships for coal liquefaction catalysts has been a difficult and time-consuming task involving numerous experiments to adequately describe catalyst performance over a range of conditions. This paper describes a method for analyzing the experimental results of coal liquefaction reactions which may be applied to a number of aspects of coal liquefaction research and process control, including: rapid selectivity and performance screening for catalysts; correlation of laboratory results with process parameters; and optimization of product yield for plant process conditions. Catalyst selectivity and performance screening will be emphasized here. The approach to selectivity relationships described is based on (1) a ternary product distribution diagram with a hyperbolic relation between product and by-product conversions and (2) a hydrogen consumption diagram which relates the product conversion to the fraction of hydrogen consumed by the production of hydrocarbon gases. Each of these diagrams correlates, on a single curve, product distributions from reactions carried out over a wide range of experimental parameters, including temperature, time and different reactors.

26765 **Chemical and physical aspects of refining coal liquids.** Shah, Y.T.; Stiegel, G.J.; Krishnamurthy, S. (Department of Chemical and Petroleum Engineering University of Pittsburgh, Pittsburgh, PA 15261). *AIP (American Institute of Physics) Conference Proceedings ;* **70**: No. 1, 256-290(1 Feb 1981). (CONF-8006116—).

From Conference on chemistry and physics of coal utilization; Morgantown, WV, USA (4 Jun 1980).

Increasing costs and declining reserves of petroleum are forcing oil importing countries to develop alternate energy sources. The direct liquefaction of coal is currently being investigated as a viable means of producing substitute liquid fuels. The coal liquids derived from such processes are typically high in nitrogen, oxygen and sulfur besides having a high aromatic and metals content. It is therefore envisaged that modifications to existing petroleum refining technology will be necessary in order to economically upgrade coal liquids. In this review, compositional data for various coal liquids are presented and compared with those for petroleum fuels. Studies reported on the stability of coal liquids are discussed. The feasibility of processing blends of coal liquids with petroleum feedstocks in existing refineries is evaluated. The chemistry of hydroprocessing is discussed through kinetic and mechanistic studies using compounds which are commonly detected in coal liquids. The pros and cons of using conventional petroleum refining catalysts for upgrading coal liquids are discussed.

26766 **Mineral matter effects in coal conversion.** Granoff, B.; Montano, P.A. (Sandia National Laboratories, Albuquerque, NM 87185). *AIP (American Institute of Physics) Conference Proceedings ;* **70**: No. 1, 291-308(1 Feb 1981). (CONF-8006116—).

From Conference on chemistry and physics of coal utilization; Morgantown, WV, USA (4 Jun 1980).

Coal is a heterogeneous, hydrogen-deficient, organic rock. In order to convert to an environmentally acceptable liquid fuel, it is necessary to: (1) add hydrogen; (2) hydrocrack to lower the molecular weight; (3) remove sulfur, nitrogen and oxygen; and (4) separate unconverted coal and mineral residues. Catalysts that are selective for increased oil production without concomitant gas formation are highly desirable. Certain naturally occurring minerals in coal, such as pyrite and clay, have been shown to enhance the liquid yield and product quality. Several high-volatile bituminous coals (KY No. 11, IL No. 6, WV, PA, etc.), with similar petrographic composition, were liquefied at 425 °C for 30 min. with creosote oil as solvent. As the mineral content of the feed coal increased from 5 to 24 percent, the conversion to benzene solubles increased from 22 to 74 percent. Similar trends were observed when pyrite (pulverized to minus five microns) was added to an Illinois No. 6 coal, which was then liquified at 425 °C using SRC-II heavy distillate as the solvent. These and other mineral matter effects will be discussed, and the concept of disposable catalysts for coal liquefaction will be introduced. A brief description of the pyrite-to-pyrrhotite transformation will be given.

26767 **Surface chemical problems in coal flotation.** Taylor, S.R.; Miller, K.J.; Deurbrouck, A.W. (Coal Preparation Division, PMTC, U. S. Department of Energy, Pittsburgh, PA 15236). *AIP (American Institute of Physics) Conference Proceedings ;* **70**: No. 1, 344-356(1 Feb 1981). (CONF-8006116—).

From Conference on chemistry and physics of coal utilization; Morgantown, WV, USA (4 Jun 1980).

As the use of coal increases and more fine material is produced by mining and processing, the need for improved methods of coal beneficiation increases. While flotation techniques can help meet these needs, the technique is beset with many problems. These problems involve surface chemical and interfacial properties of the coal-mineral-water slurry systems used in coal flotation.

26768 **Physical and chemical coal cleaning.** Wheelock, T.D.; Markuszewski, R. (Ames Laboratory and Department of Chemical Engineering, Iowa State University, Ames, Iowa 50011). *AIP (American Institute of Physics) Conference Proceedings ;* **70**: No. 1, 357-387(1 Feb 1981). (CONF-8006116—).

From Conference on chemistry and physics of coal utilization; Morgantown, WV, USA (4 Jun 1980).

Coal is cleaned industrially by freeing the occluded mineral impurities and physically separating the coal and refuse particles on the basis of differences in density, settling characteristics, or surface properties. While physical methods are very effective and low in cost when applied to the separation of coarse particles, they are much less effective when applied to the separation of fine particles. Also they can not be used to remove impurities which are bound chemically to the coal. These deficiencies may be overcome in the future by chemical cleaning. Most of the chemical cleaning methods under development are designed primarily to remove sulfur from coal, but several methods also remove various trace elements and ash-forming minerals. Generally these methods will remove most of the sulfur associated with inorganic minerals, but only a few of the methods seem to remove organically bound sulfur. A number of the methods employ oxidizing agents as air, oxygen, chlorine, nitrogen dioxide, or a ferric salt to oxidize the sulfur compounds to soluble sulfates which are then extracted with water. The sulfur in coal may also be solubilized by treatment with caustic. Also sulfur can be removed by reaction with hydrogen at high temperature. Furthermore, it is possible to transform the sulfur bearing minerals in coal to materials which are easily removed by magnetic separation.

26769 **Study of kinetics of carbon gasification reactions.** Katta, S.; Keairns, D.L. (Westinghouse Electr Corp, Pittsburgh, Pa). *Industrial and Engineering Chemistry, Fundamentals ;* **20**: No. 1, 6-13(Feb 1981).

The rates of carbon-steam (C-H/sub 2/O) and carbon-carbon dioxide (C-CO/sub 2/) reactions were studied in a laboratory fluidized bed with coke breeze over a temperature range of 920 to 1040/degree/C at 1013 kPa. Rate equations suggested by a simplification of the Langmuir-Hinshelwood rate expression and also Ergun's model for a fully back-mixed fluidized bed were developed for both reactions, with rate as a function of temperature and gas composition. The success of these equations in fitting gasification results affords some support for Ergun's model but not in all details, and no attempt is made to prove the detailed mechanisms for the reactions in the present study. The reaction rate was found to be indepedndent of the particle size and the inert gas concentration. The variation of the reaction rate with carbon conversion is also studied. 17 refs.

26770 **Alloy selection for sulfidation-oxidation resistance in coal gasification environments.** Bradshaw, R.W.; Stoltz, R.E. (Sandia Lab, Livermore, Calif). *Journal of Materials for Energy Systems ;* **2**: No. 1, 3-11(Jun 1980).

Iron-nickel-chromium and nickel-chromium alloys were studied for their combined sulfidation-oxidation resistance in simulated coal gasification environments. All alloys contained a minimum of 20 wt pct chromium, and titanium and aluminum in the range 0 to 4 wt pct. Corrosion resistance was evaluated at 1255 K (1800/degree/F) in both high BTU and low BTU coal gasification atmospheres with 1 vol pct H/sub 2/S. Titanium at levels greater

than 1 wt pct imparted sulfidation resistance due to an adherent oxide layer. Aluminum was less effective. Nimonic 81, Pyromet 31, IN801, and IN825 exhibited the best overall corrosion resistance. 11 refs.

26771 Corrosion and stress corrosion cracking in coal liquefaction processes. Baylor, V.B.; Keiser, J.R. (Oak Ridge Natl Lab, Tenn). *Journal of Materials for Energy Systems ;* **2**: No. 1, 12-27(Jun 1980).

Materials tested include carbon steel; ferritic stainless steels such as 26-1 and 18-2; austenitic stainless steels including L-grades and stabilized types; and nickel-base alloys such as alloys 600 and 625 and Hastellous G and C-276. Racks of U-bend specimens in welded and as-wrought conditions and unstressed surveillance coupons were exposed in pilot plant vessels. These studies identified alloys that are suitable. 37 refs.

26772 (DOE/ET/13060—T3(Vol.1)) Phase I: the pipeline-gas demonstration plant. Demonstration plant engineering and design. Volume 1. Executive summary. (Conoco, Inc., Stamford, CT (USA); Foster Wheeler Energy Corp., Livingston, NJ (USA)). [nd]. Contract AC01-77ET13060. 27p. (FE—2542-38(Vol.1)). NTIS, PC A03/MF A01. Order Number DE81025507.

The Phase I engineering and design of a demonstrated plant under Contract No. EF-77-C-01-2542 between Conoco Inc. and the US Department of Energy has been completed. The Demonstration Plant is designed to produce 19 million standard cubic feet per day of pipeline quality gas from 1,257 tons per day of Ohio No. 9 coal. The process to be demonstrated is based on the British Gas/Lurgi slagging gasifier which reacts coal with steam and oxygen at elevated temperatures and pressures to produce a crude synthesis gas. The crude gas is purified in a Rectisol unit and subsequently converted to high-Btu gas by a combination of shift/methanation, Benfield, and methanation processes. Sulfur, ammonia, naphtha, oil, and crude phenols are produced as by-products. The Stretford, Beavon, PHOSAM-W, Rectisol, and Phenosolvan processes are used to recover the by-products. Phase I of Contract No. EF-77-C-01-2542 has been completed except for the preparation of remaining reports. All reports are scheduled to be issued by June 30, 1981.

26773 (DOE/ET/13060—T3(Vol.17)) Phase I: the pipeline-gas demonstration plant. Demonstration plant engineering and design. Volume 17. Plant section 2500 - Plant and Instrument Air. (Conoco, Inc., Stamford, CT (USA); Foster Wheeler Energy Corp., Livingston, NJ (USA)). [nd]. Contract AC01-77ET13060. 124p. (FE—2542-38(Vol.17)). NTIS, PC A06/MF A01. Order Number DE81025491.

Contract No. EF-77-C-01-2542 between Conoco Inc. and the US Department of Energy provides for the design, construction, and operation of a demonstration plant capable of processing bituminous caking coals into clean pipeline quality gas. The project is currently in the design phase (Phase I). This phase is scheduled to be completed in June 1981. One of the major efforts of Phase I is the process and project engineering design of the Demonstration Plant. The design has been completed and is being reported in 24 volumes. This is Volume 17 which reports the design of Plant Section 2500 - Plant and Instrument Air. The plant and instrument air system is designed to provide dry, compressed air for a multitude of uses in plant operations and maintenance. A single centrifugal air compressor provides the total plant and instrument air requirements. An air drying system reduces the dew point of the plant and instrument air. Plant Section 2500 is designed to provide air at 100°F and 100 psig. Both plant and instrument air are dried to a -40°F dew point. Normal plant and instrument air requirements total 1430 standard cubic feet per minute.

26774 (DOE/ET/13060—T3(Vol.18)) Phase I: the pipeline-gas demonstration plant. Demonstration plant engineering and design. Volume 18. Plant Section 2700 - Waste Water Treatment. (Conoco, Inc., Stamford, CT (USA); Foster Wheeler Energy Corp., Livingston, NJ (USA)). [nd]. Contract AC01-77ET13060. 382p. (FE—2542-38(Vol.18)). NTIS, PC A17/MF A01. Order Number DE81025492.

Contract No. EF-77-C-01-2542 between Conoco Inc. and the US Department of Energy provides for the design, construction, and operation of a demonstration plant capable of processing bituminous caking coals into clean pipeline quality gas. The project is currently in the design phase (Phase I). This phase is scheduled to be completed in June 1981. One of the major efforts of Phase I is the process and project engineering design of the Demonstration Plant. The design has been completed and is being reported in 24 volumes. This is Volume 18 which reports the design of Plant Section 2700 - Waste Water Treatment. The objective of the Waste Water Treatment system is to collect and treat all plant liquid effluent streams. The system is designed to permit recycle and reuse of the treated waste water. Plant Section 2700 is composed of primary, secondary, and tertiary waste water treatment methods plus an evaporation system which eliminates liquid discharge from the plant. The Waste Water Treatment Section is designed to produce 130 pounds per hour of sludge that is buried in a landfill on the plant site. The evaporated water is condensed and provides a portion of the make-up water to Plant Section 2400 - Cooling Water.

26775 (DOE/ET/13060—T3(Vol.20)) Pipeline gas demonstration plant, Phase I. Demonstration plant engineering and design. Volume 20. Plant section 3200, miscellaneous offsites and tank farm. (Conoco, Inc., Stamford, CT (USA); Foster Wheeler Energy Corp., Livingston, NJ (USA)). [nd]. Contract AC01-77ET13060. 327p. (FE—2542-38(Vol.20)). NTIS, PC A15/MF A01. Order Number DE81025598.

Contract No. EF-77-C-01-2542 between Conoco Inc. and the US Department of Energy provides for the design, construction, and operation of a demonstration plant capable of processing bituminous caking coals into clean pipeline quality gas. The project is currently in the design phase (Phase I). This phase is scheduled to be completed in June 1981. One of the major efforts of Phase I is the process and project engineering design of the Demonstration Plant. The design has been completed and is being reported in 24 volumes. This is Volume 20 which reports the design of Plant Section 3200 - Miscellaneous Offsites and Tank Farm. Plant Section 3200 consists of a number of offsite facilities. These include tankage, shipping and receiving, fire water system, roads and fences, sewers, solid waste disposal, effluent retention dam, water intake facilities, and the water and gas pipelines. Three to four weeks storage capacity is provided for all by-products and for critical chemical supplies to the plant.

26776 (DOE/ET/13060—T3(Vol.22)) Phase I: the pipeline-gas demonstration plant. Demonstration plant engineering and design. Volume 22. Plant Section 4000 - Electrical and Communications. (Conoco, Inc., Stamford, CT (USA); Foster Wheeler Energy Corp., Livingston, NJ (USA)). [nd]. Contract AC01-77ET13060. 119p. (FE—2542-38(Vol.22)). NTIS, PC A06/MF A01. Order Number DE81025597.

Contract No. EF-77-C-01-2542 between Conoco Inc. and the US Department of Energy provides for the design, construction, and operation of a demonstration plant capable of processing bituminous caking coals into clean pipeline quality gas. The project is currently in the design phase (Phase I). This phase is scheduled to be completed in June 1981. One of the major efforts of Phase I is the process and project engineering design of the Demonstration Plant. The design has been completed and is being reported in 24 volumes. This is Volume 22 which reports the design of Plant Section 4000 - Electrical and Communications. The electrical facilities for the Demonstration Plant are a complete installation including power sources, distribution, lighting, telephone, fire alarm, communications, and aircraft warning systems. The design, materials, equipment, and installation of the electrical facilities are in accordance with the latest edition of applicable codes and regulations. The main source of power for the plant will be through a tie-in to a 138kv line operated by a public utility. This power line crosses the southern edge of the plant site. Emergency power will be generated with a 500kw diesel driven generator. Backup emergency instrument power will be supplied by a UPS (battery-inverter) system.

26777 (DOE/ET/14372—T1) Evaluation of the use of UCG gas to produce 4000 BPD and 12,000 BPD of methanol with conversion to M-gasoline. (Pritchard (J.F.) and Co., Kansas City, MO (USA)). [nd]. Contract AC01-80ET14372. 150p. NTIS, PC A07/MF A01.

This study involves an examination of the technical and economic feasibility of using raw gas from an underground coal gasifi-

cation facility as feedstock for methanol synthesis, and producing M-gasoline from the methanol. It differs from previous studies in considering facilities smaller than those previously studied. Addressed also is the economic and technical feasibility of using equipment from existing ammonia plants for the production of methanol. Ammonia and methanol plants are very similar in type of equipment used and plant layout. Consequently, it is possible to convert an existing ammonia plant into a methanol facility. Existing ammonia and methanol plants which contain equipment that might be utilized with UCG all use natural gas for feedstock. The processing steps in these plants can be divided into unit operations which are described. The product price analysis shows that significant economies of scale exist for the larger of the two facility sizes considered in this study. The economies of scale are evident for both the methanol/M-gasoline and methanol-only facilities. Compared to current market prices, the calculated product prices for the 4000 BPD and 12,000 BPD methanol-only facilities are within the range of competitiveness with the prices of conventionally produced methanol. The product prices calculated for the 12,000 BPD methanol/4910 BPD M-gasoline facility are, under the most optimistic assumptions, 50% higher than the current market price for unleaded gasoline.

0106 Properties

REFER ALSO TO CITATION(S) 26738, 26746, 26750, 26856, 27438, 27450

26778 Specific metal detection in the size exclusion separation of separation of solvent refined coal. Taylor, L.T.; Hausler, D.W. (Virginia Polytechnic Inst., and State Univ., Blacksburg). *American Chemical Society, Division of Fuel Chemistry, Preprints ;* **26**: No. 2, 100-106(29 Mar 1981). (CONF-810308—(Vol.4)).

From American Chemical Society symposium on the chemistry of engine combustion deposits; Atlanta, GA, USA (29 Mar 1981).

The high sensitivity of Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES) for metal analysis makes this system a potentially powerful metal-specific detector for liquid chromatographic separations. Pyridine has a number of features as a solvent that makes it interesting for development both as a liquid chromatography (LC) solvent and a solvent for ICP-AES. Pyridine is particularly desirable for most all synfuel materials in that it dissolves, for example, approximately 98% of solvent refined coal solid product. In addition, it has been shown to be an acceptable solvent for size exclusion chromatography (SEC) of coal derived products. The results of the SEC separation in pyridine of a variety of coal derived fractions utilizing ICP as a specific metal detector are described.

26779 (DOE/EV/10403—1) Analysis of mineral phases in coal utilizing factor analysis. Roscoe, B.A.; Hopke, P.K. (Illinois Univ., Urbana (USA). Inst. for Environmental Studies). 1980. Contract AC02-80EV10403. 12p. (CONF-801227—4). NTIS, PC A02/MF A01. Order Number DE81025043.

From Atomic and nuclear methods in fossil energy research meeting; Mayaguez, Puerto Rico (1 Dec 1980).

There is much interest in the mineral phase inclusions of coal. Some experimental results of this kind can be enhanced by the use of various statistical techniques. One such statistical technique is target transformation factor analysis (TTFA) which has been previously demonstrated to be able to resolve sources of airborne particulate matter. Initial studies of TTFA have shown it to be able to produce elemental profiles of the mineral phases in coal. An advantage of TTFA is its ability to produce reliable quantitative results with a minimum of prior knowledge. In order to further explore the utility of this approach, a data set consisting of physically fractioned coal samples was generated. These samples were analyzed by neutron activation analysis and then their elemental concentrations examined using TTFA. As this work has demonstrated, information concerning the mineral phases in coal can be acquired from factor analysis even with limited data. Additional data may permit the resolution of additional mineral phases as well as refinement of those already identified.

26780 (DOE/PC/30291—T1) Volatile production during preignition coal heating. Quarterly progress report, January 1981-March 1981. (Avco-Everett Research Lab., Inc., Everett, MA (USA)). May 1981. Contract AC22-80PC30291. 24p. NTIS, PC A02/MF A01. Order Number DE81024321.

Design and fabrication of the experimental system is complete. Mirror design has been finalized and optical configurations established for irradiation of the test section. Diagnostic development has been necessary for temperature measurement; an upgraded design of a two-color pyrometer has been made, and is being tested at this time. The computer code for laser heating of the coal particles has been rewritten in order to make it more cost effective and efficient. This is being used to assess the consequences of experimental operating conditions upon data output and evaluation of optimal operating conditions.

26781 Coal structure. Larsen, J.W. (Department of Chemistry, University of Tennessee, Knoxville, Tennessee 37916). *AIP (American Institute of Physics) Conference Proceedings ;* **70**: No. 1, 1-27(1 Feb 1981). (CONF-8006116—).

From Conference on chemistry and physics of coal utilization; Morgantown, WV, USA (4 Jun 1980).

Some aspects of the structure of coal are discussed. Emphasis is placed on the changes occurring during coalification and on the macromolecular structure of coal. The various forms of oxygen in coals are described, and the limitations to our knowledge of heteroatom functional groups are discussed. Some aspects of coal structure especially relevant to the chemical reactivity of coals are described. Much more must be learned about coal structure, both physical and chemical before realistic attempts to develop structure-reactivity relationships are possible.

26782 Size exclusion chromatography of organically bound metals and coal-derived materials with inductively coupled plasma atomic emission spectrometric detection. Hausler, D.W.; Taylor, L.T. (Virginia Polytechnic Inst. and State Univ., Blacksburg). Contract AC22-80PC30041. *Analytical Chemistry ;* **53**: No. 8, 1227-1231(Jul 1981).

Organometallic and metalloorganic compounds have been separated by size exclusion chromatography using pyridine eluent. A directly interfaced inductively coupled plasma atomic emission spectrometer was used for detection of these metal-containing species. Problems relating to the use of pyridine in the chromatography of these species are discussed. Most problems appear to be related to non-carbon-bound metal systems. The application of this technique to solvent-refined coal fractions and process solvent is presented. Evidence of solvent selectivity for some of the organically bound metals in the solvent refined coal is given.

26783 Determination of polycyclic aromatic hydrocarbons in solvent-refined coal by negative chemical ionization: charge inversion mass spectrometry/mass spectrometry. Zakett, D.; Ciupek, J.D.; Cooks, R.G. (Purdue Univ., West Lafayette, IN). *Analytical Chemistry ;* **53**: No. 4, 723-726(Apr 1981).

The unique value of charge inversion reactions in mass spectroscopy/mass spectroscopy (MS/MS) for direct characterization of polycyclic aromatic hydrocarbons in untreated solvent-refined coal is demonstrated. The positive ion MS/MS spectra of polycyclic aromatic hydrocarbons (PAHs) recorded for each of several molecular ions precursors, M^-, M^+, $(M\text{-}H)^-$, and $(M + H)^+$, show profiles which are distinctive and valuable in recognizing these compounds. Conventional electron impact mass spectra show a smaller number of fragmentations, including loss of C_2 moieties in high relative abundance. The striking differences between electron impact spectra and the various forms of MS/MS are being explored. These data demonstrate that a number of complementary reactions can be used as the basis for obtaining MS/MS spectra of polycyclic aromatics. Individual transitions in these spectra can be used to quantify PAHs in intact coal liquids. The detection limits and optimum analysis method for a series of PAHs commonly found in SRC-II at parts-per-million levels are currently being evaluated.

26784 Crosslinked macromolecular structures in bituminous coals: Theoretical and experimental considerations. Lucht, L.M.; Peppas, N.A. (School of Chemical Engineering, Purdue University, West Lafayette, Indiana 47907). *AIP (American Institute of Physics) Conference Proceedings ;* **70**: No. 1, 28-48(1 Feb 1981). (CONF-8006116—).

From Conference on chemistry and physics of coal utilization; Morgantown, WV, USA (4 Jun 1980).

Ample evidence from physicochemical experiments suggests that bituminous coals can be described as highly crosslinked and entangled networks of macromolecular chains of irregular structure. Theoretically these structures can be analyzed by statistical mechanical models considering non-Gaussian distribution of the macro-molecular chains along with departure from the Flory theories of crosslinked macromolecules. The models of Kovac (1978) and Peppas and Lucht (1979) have been developed in order to describe non-extractable coal matrices and their behavior during swelling in appropriate swelling agents. The molecular weight between cross-links M/sub c/ and the crosslinking density rho/sub x/ can be determined for various solvents and equilibrium swelling ratios. Few experimental data are available to which these models can be applied. Thus, in view of these new theoretical models, experimental research must be directed towards the reexamination of extraction and swelling behavior of bituminous coals. Some of the important parameters to be determined for characterization of the physical structure of coals include the thermodynamic interaction parameter chi, the crosslinking parameters M/sub c/ and rho/sub x/ and the molecular weight distribution of the extractable coal portion.

26785 C-13 NMR on solid samples and its application to coal science. Maciel, G.E.; Sullivan, M.J.; Szeverenyi, N.M.; Miknis, F.P. (Department of Chemistry, Colorado State University, Fort Collins, Colorado 80523). *AIP (American Institute of Physics) Conference Proceedings ;* **70**: No. 1, 66-81(1 Feb 1981). (CONF-8006116—).

From Conference on chemistry and physics of coal utilization; Morgantown, WV, USA (4 Jun 1980).

^{13}C nmr spectra that approach high-resolution quality can now be obtained on solids by using high-power 1H decoupling (for eliminating the major line broadening due to ^{1}H-^{13}C dipole-dipole interactions), ^{1}H-^{13}C cross polarization (for circumventing the ^{13}C T_1 bottleneck) and magic-angle spinning (for eliminating line broadening due to chemical shift anisotropy). ^{13}C spectra with rather sharp lines are obtained for crystalline samples. For coals and other very complex mixtures, the occurrence of many different, but very similar, chemical architectures renders for most samples two rather broad resonances bands (the aromatic/olefinic carbon band and the aliphatic carbon band). Additional structural information can be obtained from the ^{13}C nmr spectrum if the coal has an unusually simple distribution of carbon bypes or if more sophisticated techniques are employed. Progress, limitations and propsects for solving important problems in coal science by the ^{13}C nmr technique are discussed.

26786 Understanding coal using thermal decomposition and fourier transform infrared spectroscopy. Solomon, P.R.; Hamblen, D.G. (Advanced Fuel Research, Inc., P. O. Box 18343, East Hartford, CT 06118). Contract ET-78-C-01-3167. *AIP (American Institute of Physics) Conference Proceedings ;* **70**: No. 1, 121-140(1 Feb 1981). (CONF-8006116—).

From Conference on chemistry and physics of coal utilization; Morgantown, WV, USA (4 Jun 1980).

Fourier Transform Infrared Spectroscopy (FTIR) is being used to provide understanding of the organic structure of coals and coal thermal decomposition products. The research has developed a relationship between the coal organic structure and the products of thermal decomposition. The work has also led to the discovery that many of the coal structural elements are preserved in the heavy molecular weight products (tar) released in thermal decomposition and that careful analysis of these products in relation to the parent coal can supply clues to the original structure. Quantitative FTIR spectra for coals, tars and chars are used to determine concentrations of the hydroxyl, aliphatic and aromatic hydrogen. Concentrations of aliphatic carbon are computed using an assumed aliphatic stoichiometry; aromatic carbon concentrations are determined by difference. The values are in good agreement with date determined by ^{13}C and proton NMR. Analysis of the solid produ ts produced by successive stages in the thermal decomposition provides information on the changes in the chemical bonds occurring during the process. Time resolved infrared scans (129 msec/scan) taken during the thermal decomposition provide data on the amount, composition and rate of evolution of light gas species. The relationship between the evolved light species and their sources in the coal is developed by comparing the rate of evolution with the rate of change in the chemical bonds. With the application of these techniques, a general kinetic model has been developed which relates the products of thermal decomposition to the organic structure of the parent coal.

26787 Low temperature chemical fragmentation of coal. Deno, N.C.; Curry, K.; Jones, A.D.; Minard, R.; Potter, T.; Rakitsky, W.; Wagner, K.; Yevak, R.J. (Pennsylvania State University, University Park, PA 16802). *AIP (American Institute of Physics) Conference Proceedings ;* **70**: No. 1, 154-167(1 Feb 1981). (CONF-8006116—).

From Conference on chemistry and physics of coal utilization; Morgantown, WV, USA (4 Jun 1980).

Trifluoroperoxyacetic acid chemically fragments coals at 25—80°. The reagent is so selective for oxidizing aromatic rings and is so inert towards benzylic hydrogen that isopropylbenzene, tetralin, indan, and dihydrophenanthrene have their benzene ring(s) totally destroyed without any evidence of oxidation at the benzylic hydrogen. The fragments contain more and different structural information relative to conventional oxidataions with Mn (7+), Cr (6+), HNO_3, and O_2. These latter selectively oxidize benzylic hydrogen.

26788 Relative abundances of common elements in coal macerals. Raymond, R. Jr. (Los Alamos Scientific Lab., NM). Contract W-7405-ENG-36. pp 105-109 of Microbeam analysis. Newbury, D.E. (ed.). San Francisco, CA; San Francisco Press, Inc. (1979).

Macerals in coal are the organic equivalent of minerals in rock. The electron probe microanalyzer was used to determine how Na, Mg, Al, Si, S, K, Ca, Ti, and Fe are distributed throughout macerals on a submicron scale. Eight types of macerals were examined: vitrinite, pseudovitrinite, fusinite, semifusinite, macrinite, micrinite, sporinite, and resinite. Analyzing a variety of coal samples elucidated several trends correlating the distribution of common elements with macerals. Coal samples ranked from low-volatile bituminous to subbituminous C and in age from Pennsylvanian to Paleocene. The most consistent relationship exists between sulfur and the various macerals. A large percentage of the micrinite samples contained abundant K, Ti, Al, Si, Na, and Fe. Al and Fe are also associated with vitrinite, but not as commonly as with micrinite. Vitrinite commonly contains Ca in low concentrations, but has a strong affinity for fusinite. Mg has a strong affinity for fusinite. Semifusinite and sporinite contain relatively high concentrations of K, Al, and Si. Additional trends concerning relative concentrations of elements were also apparent. 2 figures, 1 table. (DP)

0108 Waste Management

REFER ALSO TO CITATION(S) 26774, 27107, 27112, 27120, 27123, 27124, 27125, 27126, 27127, 27128, 27637, 27638, 27639

26789 (EPRI-WS—79-220(Vol.2), pp 614-642) **Empirical evaluation of selective catalytic reduction as an NO/sub x/ control technique.** Cichanowicz, J.E.; Giovanni, D.V. (Electric Power Research Inst., Palo Alto, CA). May 1981. NTIS, PC A17/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

Selective catalytic reduction (SCR) has been proposed as a technique for control of NO/sub x/ emissions to levels significantly below those mandated by New Source Performance Standards (NSPS) for coal-fired utility steam generators. EPRI is conducting an empirical assessment of the feasibility and cost-effectiveness of SCR, using a pilot scale system at the EPRI Arapahoe Emission Test Facility to simulate authentic coal-fired utility operating conditions. The program is a logical extension to earlier EPRI work defining economic feasibility of postcombustion control, and comple-

mentary to other pilot scale studies in the United States and Japan. The test program was initiated in September 1980 on a facility capable of treating 5000 scfm of coal-fired flue gas, equivalent to 2.5 MW of electrical generating capacity. The facility employs a regenerative air heater in series with a catalytic reactor to assess potential impacts on air heater performance. The tests will focus on four major issues important to the evaluation of SCR technology: (1) process performance as defined by NO/sub x/ removal capabilities at conditions representative of authentic utility application; (2) process operating demands including the need for monitoring and control systems, consumables such as ammonia, energy (pressure drop and auxiliary power), operating and maintenance requirements to maintain process performance, catalyst lifetime; (3) environmental impacts due to emissions of residual ammonia, SO_3, and sulfates and bisulfates of ammonia; and the potential effects on SO_2 and particulate control; and (4) systemwide operating effects such as increased operating and maintenance of downstream surfaces, heat rate penalty, limitations in load-following, etc. Results are presented for the initial tasks dealing with the evaluation of measurement techniques, and preliminary data describing reactor and air heater performance.

26790 (EPRI-WS—79-220(Vol.2), pp 744-779) **Countermeasures for problems in NO/sub x/ removal process for coal-fired boilers.** Itoh, H.; Kajibata, Y. (Kawasaki Heavy Industries, Ltd., Japan). May 1981. NTIS, PC A17/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

The construction of many coal-fired power plants is being planned as a result of the recent petroleum shortage, and so the need for the De-NO/sub x/ process for coal-fired boilers is increasing. However, there are many problems to be solved in the practical application of the De-NO/sub x/ process for coal-fired boilers, because high concentrations of dust particles and SO/sub x/ are contained in the flue gas. The major problems are: (1) catalyst bed pluggage and catalyst erosion by dust particles; (2) the influence of unreacted NH_3 and SO_3 from the De-NO/sub x/ reactor to the downstream equipment; and (3) deactivation of the catalyst by dust particles and SO/sub x/. Kawasaki Heavy Industries Co., LTd., (KHI) has been working to solve these problems and to put the De-NO/sub x/ process into practical use for coal-fired boilers with the cooperation of Electric Power Development Co., Ltd. for many years. We have developed superior catalysts having several characteristics, which include long life, SO/sub x/ resisting properties, dust resisting properties and low conversion of SO_2 to SO_3. Further, we have solved the above problems and have developed the most economical and stable De-NO/sub x/ process. This paper describes the problems involved in the practical application of the De-NO/sub x/ process for coal-fired boilers and the countermeasures undertaken in KHI's De-NO/sub x/ process.

26791 (EPRI-WS—79-220(Vol.2), pp 768-779) **Treating flue gas from coal-fired boilers for NO/sub x/ reduction with the shell flue gas treating process.** Pohlenz, J.B.; Braun, A.O. (UOP Inc., Des Plaines, IL). May 1981. NTIS, PC A17/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

Copper as copper sulfate ($CuSO_4$) is one of the group of metals which at temperatures of 350 to 450°C catalyzes the selective reduction of NO/sub x/ in flue gas to nitrogen and water with ammonia (NH_3). Conversions and efficiency (ammonia utilization) are high, resulting in low concentrations of both NO and NH_3 in the treated gas. If flue gas containing both sulfur and nitrogen oxides and the reductant ammonia is processed over copper at 400°C, the copper is converted first to the oxide, then to the sulfate, and NO/sub x/ reduction begins. As the conversion to copper sulfate continues, the NO/sub x/ content of the treated gas decreases to a minimum value and the SO/sub x/ increases. Copper sulfate can be reduced with a variety of fuels, e.g., H_2, CO, CH_4, etc., at 400°C, yielding a concentrated stream of SO_2, along with water and the copper in elemental form. Thus, the copper system provides the technical base for flue gas treating capable of SO/sub x/ reduction, NO/sub x/ reduction, and the simultaneous reduction of both. It offers the potential of a dry process, without by-products, and with modest energy requirements.

26792 (EPRI-WS—79-220(Vol.2), pp 782-817) **Hitachi Zosen NO/sub x/ removal process applied to coal-fired boilers.** Wiener, R. (Chemico Air Pollution Control Corp., New York, NY); Winkler, P.; Tanaka, S. May 1981. NTIS, PC A17/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

Hitachi Zosen is a leading supplier of flue gas treatment systems for the removal of nitrogen oxides. They have nine commerical plants in operation. Early in 1978 Chemico Air Pollution Control Corp., wholly owned subsidiary of Envirotech Corporation, acquired the North American license for the Hitachi Zosen technology, a dry process with selective catalytic reduction using ammonia. Because many sources of flue gas which require nitrogen oxide removal also contain a high level of dust, Hitachi Zosen has expended a considerable effort in developing a catalyst bed which can operate without plugging even though the gas contains particulates. Pilot plant tests using a specially designed metallic catalyst have been successfully operated on very dirty gases from steel sinter operations, and coal-fired boilers. An extensive pilot plant program has been in operation for over a year at Georgia Power Company's Plant Mitchell in Albany, Georgia. This is a 0.5 MW equivalent demostration plant for coal-fired denitrification which is sponsored by US EPA. Hitachi Zozen and Envirotech/Chemico believe that this testing has shown the effectiveness of the process over extended operating periods and the soundness of the control system and basic design. 11 figures, 1 table.

26793 (EPRI-WS—79-220(Vol.2), pp 820-842) **Babcock-Hitachi NO/sub x/ removal process for flue gases from coal-fired boilers.** Narita, T. (Babcock-Hitachi, Tokyo, Japan); Kuroda, H.; Arikawa, Y.; Nakajima, F. May 1981. NTIS, PC A17/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

In the previous symposium in 1978 we presented a paper titled Some Experiences of NO/sub x/ Removal in Pilot Plants and Utility Boilers. In that paper we stated the history of developments of our process, catalyst characteristics and several operating experiences. This time we intend to introduce some of the improvements and developments which we have achieved since then. As far as coal-fired applications are concerned, there are two systems required. The first one is DeNO/sub x/ with low dust loading where the DeNO/sub x/ reactor is located downstream of the hot electrostatic precipitor (EP), and the second is DeNO/sub x/ with high dust loading where the DeNO/sub x/ reactor is located upstream of the cold EP. Although the selection of EP system should be determined mainly from the standpoint of performance of collecting fly ash through the boiler, our DeNO/sub x/ process is applicable in either case. As for the two commercial DeNO/sub x/ plants with low dust loading from coal-fired boilers, we have already completed the design and manufacture, and they will go into commercial operation in November of 1980 and in July of 1981, respectively. Concerning the DeNO/sub x/ with high dust loading, we will introduce in this paper the results of abrasion and performance tests under dust concentration of 15 to 20 g/Nm^3, through which we have confirmed the reliability of the catalyst. Furthermore, another important thing in the Selective Catalytic Reduction (SCR) process is to reduce the conversion of SO_2 to SO_3 in order to minimize the influence on the downstream equipment. We have developed a catalyst with the lowest conversion rate less than 0.5% without decreasing the NO/sub x/ conversion activity at the rated load. 13 figures.

26794 (EPRI-WS—79-220(Vol.2), pp 844-868) **Test summary of an integrated flue gas treatment system. Utilizing the selective catalytic reduction process for a coal-fired boiler.** Aoki, N. (Ishikawajima-Harima Heavy Industries Co., Ltd., Tokyo, Japan); Cvicker, J.S. May 1981. NTIS, PC A17/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

This research program was initiated to investigate whether denitrification of flue gases from a coal-fired boiler can be effectively accomplished by using the selective cataytic reduction process in combination with desulfurization and dust control as an integrated system. An experimental system was designed to handle between

1000 and 2000 NM^3/hr of flue gas and measure such parameters as catalyst life, catalyst plugging, catalyst abrasion rate due to ash, air heater plugging, hot electrostatic precipitator (ESP), wet ESP, and bag filter efficiencies, along with the efficiency of a limestone desulfurization system. The results of this testing have shown that this integrated approach to flue gas cleanup is feasible and may be incorporated into a full-scale, coal-fired boiler flue gas design. This testing will be continued to develop a more reliable integrated flue gas treatment system prior to commercialization. 7 figures, 2 tables.

26795 (EPRI-WS—79-220(Vol.2), pp 870-898) **Development of a catalytic NO/sub x/ reduction system for coal-fired steam generators.** Sengoku, T. (Mitsubishi Heavy Ind., Ltd., Tokyo, Japan); Todo, Y.; Yokoyama, N.; Howell, B.M. May 1981. NTIS, PC A17/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

Work done recently by Mitsubishi Heavy Industries in Japan has resulted in the design and successful operation of a full scale catalytic NO/sub x/ reduction system for coal-fired utility steam generators. This paper describes the program carried out to evaluate the commercial feasibility of catalytic nitrogen oxides removal from coal fired power plant flue gases. Also discussed is the design of a catalytic removal system for a large modern coal-fired central station. Testing of pilot catalytic systems on coal fired steam generators was initiated at the Takasago station of EPDC in early 1977 using plate type catalysts. After two stages of testing, the plate type catalysts were replaced by grid type catalysts and testing was resumed (fall 1979). Since the conversion to grid type supports, more than 5000 hours of operation has been logged while maintaining more than 80 percent NO/sub x/ removal in both low and high dust load environments. At the Nakoso station of the Joban Joint Power Co. a grid type pilot catalytic system has been operating for over 10,000 hours with a removal efficiency of 84 percent. Operating under both high and low dust loads, draft losses have been maintained at low levels with only limited soot blowing during low dust loading and no soot blowing during high dust loading. At the Shimonoseki station of the Chugoku Electric Power Co., the first full scale system for a coal-fired boiler (175-MW) in the world has run smoothly since startup in April of this year. Removal efficiency has been 51 percent, as expected, and the ammonia slip less than 1 ppM. The paper also discusses ammonia slip, gas flow requirements, catalyst life and catalyst blinding from fly ash. The design of a 500-MW commercial unit based on the results of the test program is described and the various factors affecting large commercial design are discussed as well.

26796 **(NYSERDA—80-33) Assessment of needs and management options for the disposal of coal wastes in New York state.** (Hart (Fred C.) Associates, Inc., New York (USA)). Nov 1980. 285p. New York State Energy Research and Development Authority, Albany. Order Number DE81903583.

This report examines the issues involved in the disposal of coal wastes in New York state with the intent to enable the state and its utilities to develop reasonable coal conversion and coal/oil conversion plans. The basic objectives of the study are (1) assess the current status of coal waste disposal in the state and identify the State's heretofore undeveloped capabilities for coal waste disposal, and (2) identify areas of research that will meet both short-term and long-term management needs for different types of coal waste. Management needs are defined as plans for disposing of and/or for utilizing coal wastes in an economically, environmentally, and socially acceptable manner. Wastes examined include those combustion products resulting from the utilization of coal and coal/oil mixtures and from utilization of particular combustion techniques such as fluidized-bed. To accomplish the objective of the study, four tasks were undertaken: (1) coal waste disposal practices in New York State; (2) a thorough assessment of the present and potential impact of federal, state, and local regulations on coal waste disposal alternatives; (3) a state-of-the-art assessment of coal waste disposal methods, including reduction of waste streams, resource recovery, land disposal, ponding, mine and quarry disposal, and ocean disposal; and (4) identification of coal waste management options and research needs.

26797 **Utilization of coal slag from pressurized coal-gasification plants.** Kennedy, C.R.; Kreis, S.W.; Poeppel, R.B.; Laskiewicz, R.A. (Argonne Natl Lab, Ill). *Journal of Materials for Energy Systems ;* **2**: No. 1, 51-54(Jun 1980).

On heating to a temperature in the 800 to 900°C range, this slag expands to as much as twenty times its initial volume, producing a glass foam that could be used to produce a light-weight foam with a thermal conductivitY and density comparable to those of vermiculite.

0109 Environmental Aspects

REFER ALSO TO CITATION(S) 27113, 27114, 27115, 27116, 27117, 27118, 27119, 27564

26798 **(CONF-800114—1) Establishment of bryophytes on a reclaimed surface mine site at Goose Lake Prairie State Park, Illinois.** Rastorfer, J.R. (Argonne National Lab., IL (USA); Chicago State Univ., IL (USA). Dept. of Biological Sciences). 1980. Contract W-31-109-ENG-38. 46p. NTIS, PC A03/MF A01. Order Number DE81023114.

From 3. symposium on nuclear physics; Oaxtepec, Mexico (3 Jan 1980).

The location of the site at Goose Lake Prairie State Park provided an impetus to revegetate the reclaimed acid minesoil as a demonstration site with prairie floristic species. Because many bryophytes are pioneer plants and because baseline data were needed, surveys were made (1976-1978) to ascertain the natural establishment of mosses and liverworts on the site. Different habitats were surveyed with respect to types of fine-textured mineral soils; namely, abandoned (cultivated) field soil, old minesoil (spoil), and two reclaimed minesoils distinguished by reclamation efforts initiated in 1972 to 1973 and 1975 to 1976. Thirty moss species and one liverwort species were identified from the entire site, and two additional moss species were found in areas adjacent to the site. The role of bryophytes in the development of prairie plant communities on reclaimed minesoil is still uncertain. However, existing research data provide support for the following hypotheses: (1) bryophytes should help reduce soil erosion by binding soil particles via their rhizoidal systems, and by the relatively high water-holding capacity of their gametophytic shoots; (2) bryophytes might reduce heavy-metal toxicity to certain vascular plants at soil surfaces, because they have an ability to accumulate these elements; and (3) bryophytes may enhance nitrogen fixation through their associations with blue-green algae and possibly with nitrogen-fixing bacteria.

26799 **(CONF-8007107—1) Potential for reclaiming surface coal mines for recreation.** Bernard, J.R. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 7p. NTIS, PC A02/MF A01. Order Number DE81023538.

From International symposium on the human side of energy; Laramie, WY, USA (7 Jul 1980).

The US Surface Mining Control and Reclamation Act of 1977 provides for consistent standards in coal mining and reclamation, while requiring more input from local governments in planning reclamation activities. The regulations of the Act explicitly allow the use of reclaimed lands for public purposes, such as recreation, if certain conditions are met. Boomtowns in western coal-producing areas will require parks and other public facilities to accommodate population peaks; these needs can be fulfilled in a few cases less expensively by suitable reclamation planning for nearby strip mines in cooperation with mining companies. In non-western coal provinces, surface mines within a short distance of towns can now more readily be considered as possible areas for developing public facilities. With rising prices for recreational travel, it may become increasingly attractive to develop recreational facilities closer to communities. Because of the lack of local public agency familiarity with reclamation and its potentials, it may be some time before reclamation and community needs are integrated. This paper provides information on the opportunities for and obstacles to development of recreation resources on reclaimed lands.

26800 (IS-M—326) Ground water monitoring system design: the Iowa Coal Project demonstration mine No. 1, a case study. Kipp, J.A.; Gulliford, J.B.; Stangl, D.W.; Sendlein, L.V.A. (Ames Lab., IA (USA); Illinois Mining and Mineral Resources Research Inst., Carbondale (USA); Southern Illinois Univ., Carbondale (USA). Coal Extraction and Utilization Research Center). 1979. Contract W-7405-ENG-82. 7p. (CONF-791262—1). NTIS, PC A02/MF A01. Order Number DE81023792.

From Symposium on surface mining hydrology, sedimentology and reclamation; Lexington, KY, USA (4 Dec 1979).

The surface mining of Midwestern coals often causes detrimental changes in associated surface and ground water supplies. The Iowa Coal Project was initiated to study the economic feasibility of the surface mining of Iowa's coal and the subsequent reclamation of areas affected by mining. One portion of this study is designated to monitor the hydrogeological impacts of mining on a 40 acre study site in southeastern Iowa. The purpose of this environmental is two fold. The first objective is to monitor the ground water quality of the mine site for alterations caused by acid effluent generated in mining cuts, highwalls, and spoil storage areas. The second objective is to measure the piezometric changes which occur in the geologic materials in and around the mine. A monitoring network of 49 ground water piezometers and sampling tubes has been placed to accomplish these goals. Additional hydrogeologic data pertaining to the materials of the study site were obtained from drilling logs of 35 auger holes and 26 coal exploration holes. Documentation of background conditions was achieved by fitting many of the exploration borings with sampling tubes. All wells are constructed of 1 1/2 and 2 inch PVC pipe with slotted screens surrounded by pea rock. Nesting of several well casings in individual auger holes allows for an analysis of the vertical distribution of the water which is resaturating the spoil. Bentonite backfill in the holes limits leakage between the different materials penetrated in each location.

26801 (MTR—79W-159-03) Environmental effects of coal technologies: research needs. (Mitre Corp., McLean, VA (USA). METREK Div.). Jun 1981. Contract AC01-79EV10018. 234p. NTIS, PC A11/MF A01. Order Number DE81025161.

This report addresses major environmental problems associated with conventional coal mining, storage, transportation, and combustion, and with chemical coal cleaning, in situ gasification, fluidized bed combustion, cocombustion of coal-oil mixtures, and cocombustion of coal with municipal solid waste. It presents recommended research required to address the identified problems. The report reflects the subjective judgements of well chosen research scientists in the disciplines of air and water transport and transformation and ecological effects. The findings in this report relate primarily to effects related research. Control technology research and development needs were not specifically addressed. Site-specific data gathering needs with respect to Environmental Impact Statement (EIS) assessments are not included. However, the results of the proposed research will be highly useful and applicable to such assessments and pollution control development.

26802 Mixing and separation device for continuous flow bioassays with coal liquids. Dauble, D.D.; Lusty, E.W.; Fallon, W.E.; Gray, R.H. (Pacific Northwest Lab., Richland, WA). Contract AC06-76RL01830. *Bulletin of Environmental Contamination and Toxicology ;* **26**: No. 6, 717-723(Jun 1981).

Efforts to increase United States' use of synthetic fuels, such as those derived from coal liquefaction, require examining potential toxicity of coal liquids that may eventually be released to the aquatic environment. Since maintaining constant levels of the water soluble fraction (WSF) of coal liquids is complicated by presence of easily biodegradable phenolic compounds and since problems with low oxygen levels may occur with static tests, flow-through test systems must be employed. Although, batch-prepared WSFs of solvent refined coal (SRC) II materials were adequate for short-term continuous flow or static tests, a system was needed that would generate a stable WSF for long-term continuous flow bioassays. We developed a method to generate a reproducible stock solution for exposing aquatic organisms to sublethal concentrations of coal liquid WSFs under flow-through conditions. The WSF is efficiently extracted, thus reducing costs associated with waste treatment of the potentially hazardous materials.

26803 Restoration of acidic mine spoils with sewage sludge: II. Measurement of solids applied. Stucky, D.J.; Zoeller, A.L. (ANL). *Reclamation Review ;* **3**: No. 3, 141-147(1980).

Sewage sludge was incorporated in acidic strip mine spoils at rates equivalent to 0, 224, 336, and 448 dry metric ton/ha and placed in pots in a greenhouse. Spoil parameters were determined after 48 hr and again after orchardgrass was planted on the spoils. Parameters measured were: pH, organic matter content, cation exchange capacity, electrical conductivity, and yield. Values for each parameter differed significantly at the two sampling times. Data from the first measurement were found to have the greatest predictability value. Results indicate that soil properties can be used to estimate amounts of sewage sludge solids required to reclaim acidic mine spoils.

0120 Mining

REFER ALSO TO CITATION(S) 26856

26804 (DOE/ET/12201—T1) Development of operational aids for improved dragline utilization. Final technical report, May 30, 1981. Eschman, C.W.; Thorn, J.S.; Trelz, M.A. (McDonnell Douglas Electronics Co., St. Charles, MO (USA)). May 1981. Contract AC22-76ET12201. 112p. (FE—8922-4). NTIS, PC A06/MF A01.

The Dragline Data Link Prototype System, developed under DOE Contract Number DE-AC22-76ET12201, Modification M007, provides for direct data transfer between the Display and Information Gathering System (DIGS) located on board a dragline and a computer system located in the mine office. Reports of dragline activity available from the DIGS on the dragline can also be accessed from the mine office. This report describes the Data Link System design, installation, application and evaluation in a working mine environment.

26805 (DOE/ET/14052—1) Built-in Test Equipment (BITE) to improve front-end-loader productivity. Technical progress report. (McDonnell Douglas Electronics Co., St. Charles, MO (USA)). May 1981. Contract AC22-80ET14052. 72p. NTIS, PC A04/MF A01.

This Topical Report describes an equipment system being developed to improve the availability and productivity of large front-end loaders used in surface-mining operations. The equipment is mounted on the front end loader and includes an operator display and keypad, a microcomputer, machine sensors and a signal conditioner. Safety and machine performance problems are displayed to the operator and a report is printed for the maintenance shop. The BITE equipment, environment and system operation are described.

26806 (DOE/PC/30123—T2) Methane modeling: predicting the inflow of methane gas into coal mines. Quarterly technical progress report, April 1, 1981-June 30, 1981. Boyer, C.M. II; Morrison, H.L.; Schwerer, F.C. (United States Steel Corp., Monroeville, PA. Research Lab.). 15 Jul 1981. Contract AC22-80PC30123. 33p. NTIS, PC A03/MF A01. Order Number DE81026018.

This second quarterly technical progress report consists of revisions and extensions to the sections submitted with the first quarterly reports which concern the literature review and the selection of mathematical model components. Salient features of the second quarterly report are the following. (I) A number of new literature search strategies were designed and executed. References identified in the computer search were reviewed and relevant items have been assimilated into a project bibliography. (II) A general basic equation set has been formulated that contains mathematical components to account for a variety of physical phenomena that have been proposed as being relevant to the flow of water and gas in coal seams. The equation set is presented in a normalized form and conventions regarding nomenclature, units and scaling factors are documented. (III) A mathematical comparison is presented of a

diffusion model and a kinetic model to describe the methane sorption process. On the basis of this comparison, use of the numerically simpler kinetic-sorption model is justified.

26807 (EMD—81-17) Low productivity in American coal mining: causes and cures. Staats, E.B. (General Accounting Office, Washington, DC (USA)). 3 Mar 1981. 166p. General Accounting Office, Gaithersburg, MD. Order Number DE81903690.

Report to the Congress by the Comptroller General of the United States.

This report identifies the factors responsible for depressed productivity in the US coal mining industry. GAO analysis revealed that the fall in underground mining productivity since 1969 is closely tied to poor labor-management relations, 1974 union contract requirements, and federal mine safety and health regulation. State reclamation laws and the opening of new surface mines lowered productivity in surface mining. Coal mining technology has not advanced sufficiently to offset the loss due to these causes. Federal and state regulations have been successful in reducing both fatalities and the environmental costs of coal mining. Thus far, lower productivity is a price the nation has paid for imposed health, safety, and environmental regulations. Industry and public officials must find ways to offset the effects of regulation on productivity without compromising safety or environmental quality. GAO recommends increased federal efforts to promote the development and greater use of safe, productivity technologies, and improved labor management relations. Because of the importance of higher productivity, GAO plans to send the report to knowledgeable individuals to solicit their views on the report's conclusions, and to request suggestions on how they might be implemented. If appropriate, GAO will submit further recommendations in a subsequent report.

0130 Transport And Handling

26808 Instrumentation for transport and slurries. O'Fallon, N.M. (Argonne National Laboratory, Argonne, IL 60439). *AIP (American Institute of Physics) Conference Proceedings ;* **70**: No. 1, 198-208(1 Feb 1981). (CONF-8006116—).

From Conference on chemistry and physics of coal utilization; Morgantown, WV, USA (4 Jun 1980).

Many advanced fossil energy processes require the continuous transport of crushed coal into high pressure vessels. The most common methods of doing this are sequenced pneumatic injection from pressurized lock hoppers and pumping of a coal-liquid slurry. Operation of these and other coal feeding systems is outlined and standard instrumentation for monitoring coal feed is reviewed. Applicable new and developmental instrumentation is discussed.

0140 Combustion

REFER ALSO TO CITATION(S) 26759, 26801, 27103, 27112, 27117, 27118, 27120, 27121, 27122, 27123, 27124, 27125, 27126, 27127, 27273, 27275, 27334, 27384, 27558, 27559, 27560, 27561, 27562

26809 (DOE/PC/30300—T3) Particulate processes in pulverized-coal flames. Quarterly technical progress report, January-March 1981. (Spectron Development Labs., Inc., Costa Mesa, CA (USA)). Apr 1981. Contract AC22-80PC30300. 65p. NTIS, PC A04/MF A01. Order Number DE81025153.

Major attention has been focused on the completion of the experiment design, continuation of the experiment fabrication, and the conduct of preliminary experimental observations. The design of the entire apparatus for the dilute particle reaction experiment has been completed. This includes two reactor heads, a fluidized bed feeder, the tube reactor, and the reactor traverse mechanism. The procurement of all long lead hardware has been initiated. All hardware procurement is expected to be completed in June and the reactor assembly is expected to be completed in July. Experimental observations of ignition and devolatilization of Pittsburgh Seam HVA bituminous coal have been initiated. Observations using both front and back light pulsed laser holography and particle sizing interferometry have been made. Preliminary analysis of the data indicate that high quality results can be obtained.

26810 (EPRI-WS—80-127, pp 1.42-1.43) Research and development planning. Radway, J.E. May 1981. NTIS, PC A09/MF A01.

From Workshop on applications of fireside additives to utility boilers; Boston, MA, USA (3 Aug 1980).

26811 (ORNL/TM—7612, pp 120-133) Combustion systems. Jul 1981. NTIS, PC A09/MF A01.

In Advanced research and technology development fossil energy materials program plan for FY 1981.

This section includes discussions on materials for application in both fluidized-bed and conventional combustion systems. Some programs discussed in this section may also apply to coal gasification systems. Emphasis of these materials programs is, however, on combustion systems.

26812 Multiplicity patterns in atmospheric fluidized bed coal combustors. Congalidis, J.P.; Georgakis, C. (Massachusetts Inst. of Technology, Cambridge). *Chemical Engineering Science ;* **36**: No. 9, 1529-1545(1981).

A new mathematical model has been developed for the analysis of the steady state characteristics of Atmospheric Fluidized Bed Coal Combustors. A physical understanding of the different processes occuring within the bed is incorporated in the development of detailed mass and energy balances for the different reactor phases (bubble and emulsion phase, sorbent and coal particles). Care is placed on the modeling of the homogeneous and heterogeneous oxidation reactions, the growth of bubbles within the bed by coalescence and the heat transfer between the solids and the immersed steam generating tubes. Furthermore a population balance for the coal particles which accounts for variable size feed, fines elutriation and solids overflow enables the calculation of two very crucial bed operating variables: the carbon loading and the combustion efficiency. The model also predicts the temperature and the O_2 and CO concentrations within the combustor. The numerical solution of the dimensionless model equations is based on their reduction to a system of three nonlinear algebraic equations. Three steady states are obtained in the industrially important region of design and operational characteristics. They correspond to a high intermediate and low reactor temperature and combustion efficiency. At the same time the respective values of carbon loading and O_2 concentrations are low, intermediate and very high. The results indicate that there exists a critical value of the coal feed rate, or of the superficial gas velocity, below which the bed is extinguished.

0150 Marketing And Economics

REFER ALSO TO CITATION(S) 26752, 27108, 27236, 27237, 27243

0160 Health And Safety

REFER ALSO TO CITATION(S) 27764, 27765, 27812, 27813

0170 Legislation And Regulations

REFER ALSO TO CITATION(S) 27235, 27242, 27647, 27648, 27694

26813 (EPRI-CS—1834) Methodology for determining the impact of environmental regulatory programs. Final report. Delaney, B.T.; Roderique, D.D.; Sekulic, T.S. (Hart (Fred C.) Associates, Inc., New York (USA)). May 1981. 165p. (TPS—79-743). NTIS, PC A08/MF A01. Order Number DE81903429.

The report provides a systematic review of major federal environmental legislation and regulatory programs affecting the management of air, water, land and solid waste. The legislation and regulatory programs summarized include: Clean Air Act and Amendments of 1977; Clean Water Act and Amendments of 1977; Safe Drinking Water Act; Resource Conservation and Recovery Act; Surface Mining Control and Reclamation Act; Toxic Substances Control Act; and Consolidated Permit Program. The overall goal of this report is to examine existing and future environmental regulatory programs in order that their potential impact on the development and commercialization of advanced, coal-based energy con-

version systems can be recognized, assessed, and planned for. Moreover, it was determined that the analysis and interpretation of technical information and data collected during the study would be directed towards the development of a methodology by which environmental impacts could be systematically reviewed and problem areas identified. Needed research and engineering activities suggested by this approach would enable an advanced, coal-based energy conversion system to expeditiously proceed from project development through commercialization.

02 PETROLEUM

0202 Geology And Exploration

REFER ALSO TO CITATION(S) 27238

26814 **(DOE/FE/33210—02(Vol.2)) Smaller abandoned Texas oil fields.** (Boston Technologies, Inc., Cambridge, MD (USA)). Jul 1981. Contract AC01-79RA33210. 330p. NTIS, PC A15/MF A01. Order Number DE81025912.

The DOE document, DOE/RA133210-01, Abandoned Texas Oil Fields was released in December 1980. This publication listed 676 abandoned fields that produced 250,000 or more barrels of oil before abandonment. Favorable public response has prompted this new publication listing approximately 1800 smaller abandoned Texas fields with cumulative preabandonment productions in the 50,000 to 250,000-barrel range.

0203 Drilling And Production

REFER ALSO TO CITATION(S) 27417

26815 (CONF-810718—, pp 15p, Paper 4) **Alkaline waterflooding demonstration project, Ranger Zone, Long Beach Unit, Wilmington Field, California.** Kemp, P.B. (City of Long Beach, CA); Mayer, E.H. Jul 1981. NTIS, PC A12/MF A01.

From Annual heavy oil/EOR contractor report meeting; San Francisco, CA, USA (27 Jul 1981).

No short term solution was found to the floc formed when the concentrated saline brine was added to the soft water-alkali stream. Soft water with alkali but no salt was injected through mid-August, 1980. At that time, alternating weekly injection of soft water-salt and soft water-alkali slugs was begun. This and three well acid jobs restored the injection rate. Corrosion continued to be a problem. Both the saline and alkaline slugs are to have an inhibitor added. Produced water samples failed to indicate alkaline breakthrough to any of the producers. Reservoir simulation work indicated that oil rate response and total incremental oil recovery were dependent on the alkaline concentration and alkaline slug size as well as the alkaline flood relative permeability adjustment being postulated. Alkaline consumption was calculated to be very large. Routine well servicing and surveying continued. Redrilling and major well repair was less than in earlier years. 9 figures, 6 tables.

26816 (CONF-810718—, pp 8p, Paper 5) **Carbon dioxide for the recovery of crude oil.** Doscher, T.M.; Oyekan, R.; Gharib, S. (Univ. of Southern California, Los Angeles). Jul 1981. NTIS, PC A12/MF A01.

From Annual heavy oil/EOR contractor report meeting; San Francisco, CA, USA (27 Jul 1981).

The study of the use of carbon dioxide for the recovery of residual crude oil has continued into the third year. The most recent studies on displacement of residual oil in the scaled physical models have centered on the use of viscous aqueous solutions to follow slugs of carbon dioxide. The results indicate a positive benefit in the use of these viscous solutions only when less than an optimum slug of carbon dioxide is injected. Solubility and swelling tests on crude oils of a gravity less than the 45° Appalachian crude, which had already been studied in great detail, have also been undertaken so that eventually these characteristics can be correlated with displacement efficiency. A marked reduction in solubility of the carbon dioxide and swelling of the crude has been observed when working with 20° crudes from south Texas fields. Following up on previous conclusions that the effect of carbon dioxide in mobilizing and displacing residual crude oil is primarily due to solution and swelling, a search was made for other gases that would have a comparable effect in order to develop further support for the hypothesis. Literature studies indicated that nitrous oxide had many similar molecular and physical properties to those of carbon dioxide; including solubility in organic fluids. Initial studies have now proven that nitrous oxide does displace residual crude oil in the scaled models even somewhat more efficiently than does carbon dioxide. However, it does not appear that nitrous oxide is a cost effective substitute for carbon dioxide. 6 figures.

26817 (CONF-810718—, pp 12p, Paper 6) **Role of clays in enhanced recovery of petroleum.** Somerton, W.H.; Radke, C.J. (Univ. of California, Berkeley). Jul 1981. NTIS, PC A12/MF A01.

From Annual heavy oil/EOR contractor report meeting; San Francisco, CA, USA (27 Jul 1981).

Clays present in oil producing formations may have an important effect on the success or failure of an enhanced recovery operation. The large surface area of clays and the usually high reactivity of these surfaces may lead to loss of injected chemicals by adsorption, exchange or dissolution. Disruption of the equilibrium of the rock and its contained fluids caused by injecting fluids of different chemical composition may result in the release and migration of fines and subsequent deposition in pore necks or other restrictions in the structure of the rock. This may cause serious reduction in flow capacity of the rock. Reported in this paper are the results of study of a number of cores from California oil producing formations which are possible candidates for enhanced recovery operations. Mineral compositions and structural characteristics of the cores are reported with particular emphasis being given to the clays (less than 2 μm). The relative amount of clays, their surface area, mineral composition and cation exchange capacities are determined with the aim of obtaining correlations with chemical loss and fluid flow characteristics. The relative locations of clays and their distribution in these unconsolidated cores are being studied by new preparation techniques. Two of the most important findings are: (1) although most cores showed a serious reduction in permeability upon changing the chemistry of the flowing fluid, no direct correlation with amount of clays or type of minerals contained therein could be established. However, the relative locations of the clays do seem to have a bearing on the change in flow capacity, (2) chemical dissolution is substantially more pronounced for amorphous silica and finely divided quartz than for other minerals including kaolinite, montmorillonite, and feldspar.

26818 (CONF-810718—, pp 10p, Paper 7) **Bodcau In Situ Combustion Project, Bellevue Field, Louisiana.** (Cities Service Co., Jackson, MS). Jul 1981. NTIS, PC A12/MF A01.

From Annual heavy oil/EOR contractor report meeting; San Francisco, CA, USA (27 Jul 1981).

The Bodcau In Situ Combustion Project is being conducted in the shallow upper cretaceous Nacatoch sand in the Bellevue Field, Bossier Parish, Louisiana. Five elongated patterns encompassing 20 acres were developed for the demonstration of a commercial scale project utilizing forward combustion with simultaneous air and water injection. The air injection phase of the project was terminated April 10, 1981, with the conversion of the fifth injector to water injection only. During the combustion phase 10 BCF of air and 2.64 MMBW were injected, resulting in the recovery of 626 M barrels of 19°API crude oil. Post burn core holes were drilled in one of the patterns to evaluate the sweep efficiency of the process. During the combustion phase, operating expenses and taxes have amounted to $6.16 million, an average of $11.25 per net barrel. Total investments for the project have been $1.69 million.

26819 (CONF-810718—, pp 21p, Paper 8) **Analysis of reactions occurring in in-situ combustion.** Fassihi, M.R.; Brigham, W.E. (Stanford Univ. Petroleum Research Inst., CA). Jul 1981. NTIS, PC A12/MF A01.

From Annual heavy oil/EOR contractor report meeting; San Francisco, CA, USA (27 Jul 1981).

Continuous analysis of gases produced from a small packed bed reactor filled with oil sand made it possible to identify and

measure three consecutive chemical reactions as the temperature of oxidation increased: (a) low-temperature oxidation appears to occur between the gas and liquid phases; (b) middle-temperature fuel deposition reactions appear to be homogeneous (gas-gas); and (c) high-temperature fuel combustion reactions appear to be heterogeneous (gas-solid). The latter was found to be the rate determining step in clean sands. Natural cores from the reservoirs were found to have different kinetic performances than the clean sand matrices. This was attributed to the following reasons: (a) clay and metallic additives lower the activation energy of the combustion reaction and hence shift the rate-determining step; and (b) finer sands adsorb more fuel. The proposed kinetic model was found to be applicable to the five oils tested and hence may be generalized for application to any oil. 17 figures, 10 tables.

26820 (CONF-810718—, pp 11p, Paper 9) **Williams Holding lease steamflood demonstration project, Cat Canyon Field, Santa Barbara County, California.** Loftus, S.R.; Adamson, G.R. (Getty Oil Co., Ventura, CA). Jul 1981. NTIS, PC A12/MF A01.

From Annual heavy oil/EOR contractor report meeting; San Francisco, CA, USA (27 Jul 1981).

The objective of this pilot program is to evaluate the efficiency and economics of the steam displacement process for future full-scale development of the Cat Canyon S1-B oil sand reservoir and in similar deep heavy crude oil reservoirs. The pilot consists of four inverted five-spot patterns on five-acre spacing. Initial steam displacement began in April, 1977. Except for brief down-time periods for well and generator maintenance, steam injection was continuous until February, 1980, when injection was halted in an attempt to de-water the pilot area. De-watering operations are substantially complete and the resumption of steam injection through insulated tubing is anticipated in August, 1981. 5 figures.

26821 (CONF-810718—, pp 11p, Paper 10) **200 Sand Steamflood Demonstration Project.** Alford, W.O. (Santa Fe Energy Co., Santa Fe Springs, CA). Jul 1981. NTIS, PC A12/MF A01.

From Annual heavy oil/EOR contractor report meeting; San Francisco, CA, USA (27 Jul 1981).

Steamflooding generally has been conducted in Midway-Sunset Field Field reservoirs which have responded favorably to cyclic steam stimulation in order to increase recovery and accelerate cyclic production. Numerous heavy oil pools in this field as well as other fields have not been adequately developed because of poor cyclic steam performance. The Demonstration Project was initiated in the 200 Sand Pool to demonstrate the operational, recovery, and economic aspects of steamflooding a typical heavy oil reservoir which had unfavorable response to cyclic stimulation. This pool, designated the 200 Sand, contains approximately 50 million barrels of oil-in-place in a structure that lies between 400 and 700 feet in depth. The reservoir produced very little primary oil production and responded poorly to cyclic steam stimulation. The project is being conducted in two major phases. The first phase was a pilot test consisting of four (4) 2.35-acre inverted seven-spot steam drive patterns, which were not fully developed with producers. As a result of the response shown by the pilot, in April, 1980, the second phase was initiated by beginning work to expand the pilot area to a total of fourteen fully developed 2.34-acre inverted seven-spot patterns. Expansion to a full-scale steamflood test consisted of drilling and completing 30 producing wells and 10 steam injection wells. 6 figures, 1 table.

26822 (CONF-810718—, pp 14p, Paper 11) **Scaled physical model studies of the steam drive for the recovery of crude oil.** Doscher, T.M.; Ghassemi, F.; Omoregie, O. (Univ. of Southern California, Los Angeles). Jul 1981. NTIS, PC A12/MF A01.

From Annual heavy oil/EOR contractor report meeting; San Francisco, CA, USA (27 Jul 1981).

Work on the physical scaled models of the steam drive have now continued into their third year. During the past year the work has been extended to the study of reservoir thickness, low viscosity fluids, the concurrent use of inert gas (nitrogen) and steam, and the equivalence of a high rate gas drive of low viscosity reservoir fluids to a steam drive of high viscosity fluids. The studies have shown that reservoir thickness is not as critical a parameter in affecting the oil steam ratio as predicted by the results of analytical formulations which assume that the steam frontally displaces the reservoir fluids. Oil steam ratios in 26 foot sands are comparable to the oil steam ratios observed in 70 foot sands when gravity override dominates the process. Low viscosity fluids are so much more efficiently displaced by steam (a smaller steam volume is required per volume of fluid displaced) that even when displacing residual oil saturations, the resulting oil steam ratios are sufficiently high for the process to be considered economic given ancillary favorable parameters. The substitution of nitrogen for steam, concurrently or as sequential slugs, in a mature steam drive continues the production of oil with a resulting increase in the effective oil steam ratio of the process. Model experiments using low viscosity fluids and high rate nitrogen injection confirmed that the relationship of the controlling parameters, viz., viscosity, permeability, etc. to displacement efficiency are virtually identical to those exhibited in the steam drive. 16 figures.

26823 (CONF-810718—, pp 15p, Paper 12) **Computation of tracer production curves for various flooding patterns.** Abbaszadeh-Dehghani, M.; Brigham, W.E. (Stanford Univ. Petroleum Research Inst., CA). Jul 1981. NTIS, PC A12/MF A01.

From Annual heavy oil/EOR contractor report meeting; San Francisco, CA, USA (27 Jul 1981).

The flow of a tracer slug in several homogeneous systems has been studied. The systems considered were the developed 5-spot, and both the staggered line drive and the direct line drive with various d/a ratios. In each system, the longitudinal mixing of the tracer slug in a general streamtube of the system was dealt with rigorously. A line integral along a streamline was derived, representing the length of the mixed zone. It was determined that substitution of the line integral into the mixing equation yields an expression for the concentration of tracer at any location within a streamtube. Furthermore, these expressions, integrated over the entire streamlines of the patterns, produce a set of equations describing the pattern effluent tracer concentration. This study shows that the effluent tracer concentration depends upon the geometry, size, and dispersion constant of the system. 3 figures.

26824 (CONF-810718—, pp 13p, Paper 13) **Chemical assisted hot waterflood: modeling of the adiabatic case.** Karakas, M.; Yortsos, Y.C. (Univ. of Southern California, Los Angeles). Jul 1981. NTIS, PC A12/MF A01.

From Annual heavy oil/EOR contractor report meeting; San Francisco, CA, USA (27 Jul 1981).

The modeling of an adiabatic hot waterflood assisted by the simultaneous injection of chemical is presented. The process considered is one-dimensional, two-phase flow, with negligible effects of dispersion, heat conduction, and lateral heat losses. The model allows for the chemical to partition into the aqueous phase and to be adsorbed on the solid rock. The effects of temperature on the viscosity ratio and the adsorption kinetics and of chemical concentration on the fractional flow curves are included. The theory of generalized simple waves (coherence) is used to develop solutions for the temperature, concentration, and oil saturation profiles, as well as the oil recovery curves. The results obtained show that in the adiabatic case the combined continuous injection of chemical and hot water considerably enhances the oil recovery. The sensitivity of the recovery performance to the adsorption parameters is discussed. It is shown that, for Langmuir adsorption kinetics, the chemical resides in the heated region of the reservoir if its injection concentration is below a critical value, and in the unheated region if its concentration exceeds this critical value. 6 figures.

26825 (CONF-810718—, pp 17p, Paper 14) **Temperature effects on low tension surfactant flooding efficiency in consolidated sands.** Amabeoku, M.O.; Handy, L.L. (Univ. of Southern California, Los Angeles). Jul 1981. NTIS, PC A12/MF A01.

From Annual heavy oil/EOR contractor report meeting; San Francisco, CA, USA (27 Jul 1981).

The concurrent injection of surfactant with steam has been proposed to improve the oil recovery efficiency of the steamflood process. This mode of injection will give rise to a low tension process supplemental to the steam drive which, because of its nature, affects that portion of the reservoir where the condensed water is

flowing. In low tension flooding the surfactant reduces the interfacial tension between the aqueous surfactant phase and the oil phase and alters the capillary number significantly. This substantially releases residual oil in porous media. In surfactant flooding many parameters, namely, relative permeabilities, viscosities, interfacial tensions, dispersion, adsorption and, in this case, temperature, are coupled. An attempt has been made to decouple these parameters and identify the operative mechanisms. To accomplish this objective several flooding experiments have been performed with Berea sandstones. The surfactants used were Witco TRS 10-80 and Stepan Petrostep 465, both of which are anionic. Flood temperatures were 25°C, 82.2°C and 177°C. Core floods included sequences wherein a core was flooded to residual oil saturation with hot water followed by surfactant to further displace oil that would otherwise not be recoverable without the lowering of the interfacial tension between the residual oil and injection fluid. Also reported are floods in which the surfactant solution was used as the primary injection fluid so as to compare this mode of injection with other sequences. Water-oil relative permeability ratios were calculated at the flood temperatures. No definite temperature correlation was established, but it was observed that relative permeability to oil increased with increasing temperature while relative permeability to water was almost insensitive to changes in temperature. 15 figures.

26826 (CONF-810718—, pp 22p, Paper 16) **Formation evaluation in thermal recovery: recent work.** Brown, S.L.; Walsh, J.W. Jr.; O'Brien, W.J.; Ramey, H.J. Jr.; Sanyal, S.K. (Stanford Univ. Petroleum Research Inst., CA). Jul 1981. NTIS, PC A12/MF A01.

From Annual heavy oil/EOR contractor report meeting; San Francisco, CA, USA (27 Jul 1981).

This paper will discuss current work of two SUPRI projects concerning formation evaluation. These projects are well-test evaluation and well log analysis. The work in well-testing has been in the development of an analysis technique for pressure buildup and drawdown tests on wells being produced by steam drive or in-situ combustion. This well-test only takes a few hours and obtains the volume burned for in-situ combustion and the swept volume for a steam drive. Both parameters are important for determining the economic feasibility of a process. Field examples are shown for both a steam drive and an in-situ combustion process. Work in well log analysis is being done to try: (1) to quantify, if possible, interpretations of the carbon/oxygen log; and (2) to write hand-held calculator programs for various log combinations to allow the engineer quick calculations of reservoir parameters at the well site. The programs have been written for the analysis of shaly gas sands for the determination of R_o and TDS, and for matrix/fluid identification. A discussion will be given of the problems encountered when trying to analyze the Dresser-Atlas C/O log. These problems led to the computation of log responses for various idealized reservoir systems. These expected responses are now being correlated with Dresser-Atlas log data from the Kern River field. 13 figures.

26827 (CONF-810718—, pp 3p, Paper 17) **Project DEEP STEAM.** Fox, R.L.; Aeschliman, D.P. (Sandia National Labs., Albuquerque, NM). Jul 1981. NTIS, PC A12/MF A01.

From Annual heavy oil/EOR contractor report meeting; San Francisco, CA, USA (27 Jul 1981).

Evaluations of thermal packers and insulated delivery strings have been completed at the Tacoma facility of General Electric. Field tests of insulated delivery strings have been initiated at the Lloydminster test site of Husky Oil Co. A low-pressure combustion generator is being developed by Rockwell and a high-pressure combustion generator by Foster-Miller. Surface field tests in cooperation with Chevron are complete, and further tests are underway in cooperation with the City of Long Beach. The Project started March 7, 1978. Based on a 5-year plan, it is expected to be completed in 1983. The objectives of Project DEEP STEAM are to examine modified well completions for surface injection into deep reservoirs, develop economic downhole steam generators, and examine existing reservoir models for modifications required for steam injection into deep heavy-oil reservoirs. The project is designed to make deep steam drive a conventionally applied technique for producing low-gravity reservoirs.

26828 (CONF-810718—, pp 19p, Paper 18) **Simulation studty of detergent flooding in a vertical cross section.** Dominguez, G.C.; Dougherty, E.L.; Handy, L.L. (Univ. of Southern California, Los Angeles). Jul 1981. NTIS, PC A12/MF A01.

From Annual heavy oil/EOR contractor report meeting; San Francisco, CA, USA (27 Jul 1981).

A two-dimensional numerical model for simulating detergent flooding was developed. The model considers simultaneous flow of oil and water in a vertical cross section. The detergent (considered to be insoluble in oil) introduced in the injected water distributes itself between the water phase and the rock surface according to an equilibrium Langmuir type adsorption curve. The effect of dispersion on the distribution of detergent is considered. The model considers the typically observed relation between detergent concentration in water phase and interfacial tension, with this relation exhibiting a strong minimum at the critical micelle concentration. The relation between interfacial tension (plus flow velocity and water viscosity via the capillary number) and relative permeability and residual saturation of both oil and water is considered in turn; the relationship used was derived from recent laboratory studies at University of Southern California. The results obtained to predict effect of various parameters on oil recovery, from a system initially containing water and oil with the latter at residual saturation, are presented. Parameters considered include location of injection interval, slug size, surfactant concentration, oil viscosity and injection rate. Increase in injection rate was found to result in sigificant increase in oil recovery. For smaller fixed total amount of detergent used in a flood, the model predicts recovery to be insensitive to slug size, but for larger total amounts of detergent, larger slug sizes yield significantly higher recovery. 17 figures, 1 table.

26829 (CONF-810718—, pp 12p, Paper 19) **Field demonstration of the conventional steam drive process with ancillary materials.** Eson, R.L. Jul 1981. NTIS, PC A12/MF A01.

From Annual heavy oil/EOR contractor report meeting; San Francisco, CA, USA (27 Jul 1981).

Since steam injection became a viable recovery technique nearly three decades ago, the problems of gravity segregation and poor areal and vertical sweep efficiencies have limited recoveries in many heavy oil reservoirs. In many instances the injected steam prematurely breaks through into producing wells creating steam channels. It is believed that overall recoveries of a steam drive can be improved if the steam channeling can be controlled. This report documents efforts under a Department of Energy cost sharing contract to reduce steam channeling in a conventional steam drive using ancillary materials. A steam foam solution and a steam foam encapsulated in a polymer gel are being introduced in four steam injection patterns in the North Kern Front Field near Bakersfield, California. The ability of the ancillary materials to improve recovery will be determined through injection profiles, chemical tracer surveys, casing vent gas analysis, core and log data, and residual oil saturation data, as well as through temperature and production data. It has been shown that in-situ steam foams can be used to alter the steam injection profiles to prevent excessive steam channeling. The results of early production data have indicated that as much as 100 B/D of incremental oil is being produced by the four chemically treated patterns.

26830 (CONF-810718—, pp 18p, Paper 20) **Field demonstration of steam drive with ancillary materials.** Doscher, T.M.; Bowman, R.W.; Horcher, C.G. Jul 1981. NTIS, PC A12/MF A01.

From Annual heavy oil/EOR contractor report meeting; San Francisco, CA, USA (27 Jul 1981).

CLD Group, Inc. is conducting field demonstration tests together with DOE on the use of ancillary materials to improve the efficiency of conventional steam drive. During the past year, laboratory tests were conducted to identify surfactants with the best blocking potential, as well as optimum techniques for injecting the foaming materials. The first field test of foam injection using a 5-spot pattern in the Midway Sunset Field is complete. Radioactive tracers were employed to determine the extent of the thief zone before and after injecting surfactant. 11 figures, 15 tables.

26831 (CONF-810718—, pp 16p, Paper 21) **Improvement of steam injection through the use of foaming additives.** Al-Khafaji, A.; Mahmood, S.; Owete, O.S.; Wang, F.; Castanier, L.M.; Brigham, W.E. (Stanford Univ. Petroleum Research Inst., CA). Jul 1981. NTIS, PC A12/MF A01.

From Annual heavy oil/EOR contractor report meeting; San Francisco, CA, USA (27 Jul 1981).

One of the main problems in steam injection is mobility control. The efficiency of this process is often reduced because of the tendency of steam to channel and override. Foam has been found to be an effective mobility control agent. This study has focused on the following areas: (1) the pore-level behavior of foam flow in porous media was studied. To accomplish this, a method for observation of the flow mechanisms was developed; (2) a two-dimensional experimental simulation of the reservoir was designed. Significant improvement of the breakthrough time, gas-oil ratio and oil recovery was observed in the presence of foaming agents. This improvement was attributed to better sweep efficiency due to mobility control; (3) the foaming chemicals were studied at steam-drive field conditions. Thermal longevity, adsorption and partitioning of the surfactants between the water and the oil phase were investigated. Some commercial surfactants showed very promising results; (4) steam/foam displacement and dynamic adsorption at elevated temperatures will be studied using crude oil and reservoir matrix.

26832 (CONF-810718—, pp 11p, Paper 22) **Absolute permeability as a function of temperature and pressure.** Gobran, B.D.; Sufi, A.H.; Brigham, W.E. (Stanford Univ. Petroleum Research Inst., CA). Jul 1981. NTIS, PC A12/MF A01.

From Annual heavy oil/EOR contractor report meeting; San Francisco, CA, USA (27 Jul 1981).

While absolute permeability is an important reservoir parameter used in all flow equations, in exact nature of the dependence of porous media on the temperature of the system, confining or overburden pressure and the pore pressure of the flowing fluid is still unknown. When attempting to simulate reservoir conditions with cores in the laboratory, it is necessary to know exactly what variables can be simulated in which ways without changing the characteristics of the core. This study involves the effects of temperature, confining pressure and pore pressure on the absolute permeability of unconsolidated sand and consolidated sandstone cores. This will be the basis for later work investigating the effects of these variables and others on relative permeability measurements. 12 figures.

26833 **(DOE/BC/00034—21A) Improved pressure coring system. Annual report, October 1, 1979-September 30, 1980.** McFall, A.L.; Heckes, A.A. (Sandia National Labs., Albuquerque, NM (USA)). Jun 1981. Contract AC19-79BC00034. 17p. NTIS, PC A02/MF A01. Order Number DE81027144.

The current rapid growth in the number of enhanced oil and gas recovery projects has created a strong demand for reservoir data such as true residual oil saturations. The companies providing pressure coring services have moved to fill this need. Two recent developments have emerged with the potential of significantly improving the present performance of pressure coring. Coring bits utilizing synthetic diamond cutters have demonstrated coring rates of one-foot per minute while improving core recovery. It is also apparent that cores of a near-unconsolidated nature are more easily recovered. In addition, a special low invasion fluid that is placed in the core retriever has demonstrated reduced core washing by the drilling mud and a decrease in the complexity of preparing cores for analysis. This paper describes the design, laboratory, and field testing efforts that led to these coring improvements. Also, experience in utilizing these developments while recovering over 200 cores is discussed.

26834 **(DOE/FE/33210—2-Vol.1) Smaller abandoned Texas oil fields.** (Boston Technologies, Inc., Cambridge, MD (USA)). Jul 1981. Contract AC01-79RA33210. 429p. NTIS, PC A19/MF A01. Order Number DE81026261.

The DOE document, DOE/RA133210-01, Abandoned Texas Oil Fields which was released in December 1980 listed 676 abandoned fields that produced 250,000 or more barrels of oil before abandonment. Favorable public response has prompted this new publication listing approximately 1800 smaller abandoned Texas fields with cumulative preabandonment productions in the 50,000 to 250,000-barrel range. This new publication is available in two volumes. The format is identical to that used in Abandoned Texas Oil Fields except that the actual field location by county is not included.

26835 **(DOE/MC/10865—6) CO_2 formation damage study. First annual report.** Patton, J.T. (New Mexico State Univ., Las Cruces (USA). Dept. of Chemical Engineering). Jun 1981. Contract AC21-79MC10865. 128p. NTIS, PC A07/MF A01. Order Number DE81927524.

The objective was to learn how to avoid or minimize formation damage due to CO_2 injection processes. The study is to determine the types of chemical and physical changes that can occur in carbonate or other reservoirs because of injected carbon doxide (C_2) and/or its chemical additives and the effects on oil recovery due to those changes. During 1980, significant progress was made in determining possible mechanisms of damage and in describing them using theory. Preliminary experimental results have permitted a well defined experimental plan to be developed. Most of the apparatus has been designed and assembly of some systems has been completed. A literature search found no documented reports of CO_2 damage to oil reservoirs. The search was then expanded to include studies relating to our proposed damage mechanisms. Over 100 references are presented with abstracts, author index, and subject category.

26836 **(DOE/SF/01802—56) Bell Creek Field micellar-polymer pilot demonstration. Fourth annual report, October 1979-September 1980.** Goldburg, A. (Gary Energy Corp., Englewood, CO (USA)). Jun 1981. Contract AC19-78SF01802. 104p. NTIS, PC A06/MF A01. Order Number DE81027071.

The pilot is a contained 40-acre 5-spot located in a representative watered-out portion of the Unit A Reservoir. The pay is sandstone with an average net pay of 6.4 feet, air permeability of 1050 md, and water TDS of 2500 ppM. The average remaining oil saturation in the 40-acre pilot area was estimated to be 28% at the start of chemical injection. The Pilot has four injectors (Wells MPP-1, MPP-2, MPP-3, and MPP-4) and one producer (Well 12-1). The overall micellar-polymer oil recovery is estimated at 47% of the remaining oil at the initiation of the micellar-polymer flood. In the fourth contract year, micellar slug injection was completed and injection of the graded mobility buffer began. A second radioactive/chemical tracer test was begun at the start of the polymer phase. A delay of approximately one year was experienced during the reservoir description phase. Otherwise, the project has remained on schedule.

0204 Processing

REFER ALSO TO CITATION(S) 26842

26837 **Purported Fischer-Tropsch alkylation of benzene: reaction of benzene with aluminum trichloride revisited.** Benner, L.S.; Lai, Y.H.; Vollhardt, K.P.C. (Univ. of California, Berkeley). Contract W-7405-ENG-48. *Journal of the American Chemical Society ;* **103**: No. 12, 3609-3611(17 Jun 1981).

In 1979 it was reported that certain transition-metal carbonyls in the presence of $AlCl_3$, catalyzed the Fischer-Tropsch alkylation of benzene. This finding was re-investigated. D_2 or ^{13}CO does not result in labelled compounds. Heating benzene and $AlCl_3$ also produces alkylbenzenes. C_6D_6 gave completely labelled products. The connectivity of the initial carbon arrays is extensively preserved in the alkylbenzenes formed. (DLC)

26838 **Aspects of homogeneous carbon monoxide fixation: selective conversion of two carbonyl ligands on (eta^5-C_5H_5)Fe(CO_3^+) to C_2 organic compounds.** Bodnar, T.; Coman, G.; LaCroce, S.; Lambert, C.; Menard, K.; Cutler, A. (Wesleyan Univ., Middletown, CT). *Journal of the American Chemical Society ;* **103**: No. 9, 2471-2472(6 May 1981).

This paper reports viable reaction pathways for the stoichiometric transformation of two CO ligands on $CpFe(CO)_2^+$ (1) (Cp = eta^5-C_5H_5) selectively to the C_2 organic compounds ethane, ethylene, methyl (or ethyl) acetate, or acetaldehyde.

0205 Products And By-products

REFER ALSO TO CITATION(S) 27078

0206 Health And Safety

REFER ALSO TO CITATION(S) 26840, 26867

0207 Marketing And Economics

REFER ALSO TO CITATION(S) 26841, 26842, 26843, 27238, 27244, 27641

0208 Waste Management

REFER ALSO TO CITATION(S) 27080, 27081

26839 (DOE/ET/27085—1(Add.), pp 49-67) **Salt water disposal operations: North Markham-North Bay City Field, Matagorda County, Texas.** Corbell, H.C. (Marathon Oil Co., Bay City, TX). 1979. NTIS, PC A09/MF A01.

From Workshop on subsurface disposal of geopressured fluids; Baton Rouge, LA, USA (6 Mar 1979).

The history, operations, problems, and solutions to some of the problems in disposing of produced oil field brine in the North Markham-North Bay City Field are reviewed briefly. This field is located approximately 50 to 60 miles west-southwest of the geothermal/geopressure test well that is being drilled in Brazoria County, Texas. Marathon is currently disposing of approximately 60,000 barrels of salt water per day into 15 active disposal wells. The injection volumes per well range from 1800 barrels per day to 8500 barrels per day. Injection pressures for the individual wells range from a low of 125 psig to a high of 400 psig.

0209 Environmental Aspects

REFER ALSO TO CITATION(S) 26853, 27641, 27669, 27670, 27671, 27672, 27673, 27674, 27675, 27676, 27677, 27678, 27680

26840 (MTR—81W77, pp 7-68) **Onshore development.** Jul 1981. NTIS, PC A99/MF A01.

In Health and environmental effects of oil and gas technologies: research needs.

This section points to health research needs associated with onshore oil and gas development, with emphasis on the need for improved collection of health effects data, information on occupational health effects associated with the use of drilling fluids and chemicals and gases utilized in enhanced recovery methods, and the need for regional health assessments of the cumulative impact of airborne and waterborne contaminants associated with oil and gas production. Research is also needed on the environmental effects associated with onshore oil and gas development. Better methods should be developed to track the movement of pollutants through groundwater systems and information is needed on the transformation and fate of surfactants, solvents, and other groundwater contaminants related to oil and gas recovery. Specific research needs in the above problem areas can be found within the Summary of Reseach Needs sections. These summary sections follow related discussions of health and environmental problems. Discussion of the effects of oil spills on aquatic or terrestrial biota is presented within the Transportation and Storage section of this report.

26841 (MTR—81W77, pp 69-160) **Offshore development.** Jul 1981. NTIS, PC A99/MF A01.

In Health and environmental effects of oil and gas technologies: research needs.

This section observes that, with offshore oil and gas development, there is a need for adequate data reporting. Data on injuries, illnesses, and fatalities for onshore and offshore drilling rigs have been commingled. A more appropriate and effective information gathering and reporting system should be developed. A number of tragic offshore drilling and production rig accidents have recently focused attention on the need for greater understanding of the causal factors and poential mitigating measures which may be taken. A number of needed research and data collection activities are cited in this section. Research is needed to define offshore oil and gas worker exposures and potential health risks related to the handling of the various formulations of drilling muds. The trend toward the greater use of offshore oil and gas transfer, loading, storage, and processing facilities may pose a significant problem with respect to air pollution. The effect of these airborne emissions and possible transformation reactions should be explored. With respect to environmental effects, additional research is needed on the long-term effects associated with the release of drilling fluids in the marine environment, especially as a result of continuous loading within a developing field. Research is also needed on the effects of exploratory techniques. With the use of modern mobile rigs and subsea completion systems, the deep ocean floor of the continental shelf, its trenches, and the continental slope can be exploited. The impact of such activity on this relatively stable environmental and sensitive biota should be explored. Many impacts have been postulated to occur as a result of chronic hydrocarbon discharges into the marine environment. The cumulative impacts of such discharges should be studied through the use of natural seeps as sources of oil discharges.

26842 (MTR—81W77, pp 161-339) **Refinery operations.** Jul 1981. NTIS, PC A99/MF A01.

In Health and environmental effects of oil and gas technologies: research needs.

This section focuses on occupational and public health as it may be affected by exposure to airborne and surface-condensed toxic hydrocarbons. A voluminous amount of relevant data is available in the public domain. An intensive effort is needed to bring all of this information together and conduct a rigourous, well defined risk assessment. Several reports have appeared recently concerning large numbers of brain tumor deaths among workers at Gulf Coast petroleum refineries and petrochemical complexes. Research is needed, especially epidemiological studies, to determine the extent and cause of these occupational illnesses. A reporting mechanism should be developed for the refinery industry which will include persons other than full-time refinery workers who have jobs associated with petroleum handling. Dermal contact is a primary mechanism for exposure to hydrocarbons by refinery workers. A number of studies are needed to quantify this problem. Studies associated with occupational health are proposed as needed in the areas of biological monitoring, epidemiology, and bioassays. Research concerning public health should be conducted. Incidences of diseases in communities adjacent to petroleum refineries should be assessed and significant variations from the norm should be followed by in-depth investigation. Research regarding ecological effects should focus on the effects of airborne ethylene and phenols on the growth of natural flora and crops, especially with respect to growth rate reduction, premature abcission, and breaking dormancy. More intense research should be conducted on the use of oily wastes in landfarming. Moreover, the roles of hydrogen chloride and hydrogen fluoride should be defined. Emitted from refineries, these chemicals may have effects on the formation of acid rain, as well as other impacts on the ambient environment. Low concentrations of potentially toxic hydrocarbon in refinery effluents and in the environment should be monitored.

26843 (MTR—81W77, pp 381-431) **Transportation and storage.** Jul 1981. NTIS, PC A99/MF A01.

In Health and environmental effects of oil and gas technologies: research needs.

This section identifies several research needs associated with land transportation. A health risk assessment is needed, for example, to define the level of exposure of pipeline construction workers to coal tar pipe coatings, coal tar saturated wrapping materials, and asphalt coatings and wrapping materials. The toxic properties of ethanolamine should be studied more closely, especially with respect to dermal exposure. The potential for nitrosamine formation should be examined when ethanolamine is exposed to ambient air. Safety procedures need to be developed to protect the public from

unguarded deep trenches during pipeline construction through urban areas. Research needs related to marine transportation are also identified here. A port health and safety study should be initiated which would address best case conditions with respect to pumping, inerting, venting, and purging to minimize impact upon air quality. Such a study should include guidelines for assumptions used to evaluate emission rates associated with proposed new marine terminals. Finally, this section notes that environmental research should focus on the following areas: plant mycorrhizal associations as they are affected by crude and products; degradation of petroleum by soil biota under differing soil conditions (especially those of the semi-arid West and the Appalachian Basin subject to new oil and gas development); effect of spilled crude and products on soil bacteria, fungi, and other biota and their capacity to recover to normal levels; and the effect of vapor phase and gaseous hydrocarbon organics (including natural gas) on soil biota as a result of underground pipe ruptures.

0210 Legislation And Regulation

26844 **(EMD—81-48) Impact of regulations - after federal leasing - on Outer Continental Shelf oil and gas development.** Staats, E.B. (General Accounting Office, Washington, DC (USA)). 27 Feb 1981. 77p. General Accounting Office, Gaithersburg, MD. Order Number DE81903694.

Report to the Congress by the Comptroller General of the United States.

The Outer Continental Shelf potentially can provide the nation with significant future oil and gas resources. But, the full potential will not be realized unless: various federal agencies involved issue permits and complete other authorization actions within a standard, reasonable time which GAO believes should be a maximum of 90 days; coastal states are encouraged to develop processes for local reviews and issuing permits which are more timely and uniform with federal processes; credibility of the environmental review process is more clearly established to minimize challenges and delays; and more federal leadership and agency expertise are focused on Outer Continental Shelf activities in the years ahead.

26845 **(EMD—81-59) Issues in leasing offshore lands for oil and gas development.** (General Accounting Office, Washington, DC (USA)). 26 Mar 1981. 104p. General Accounting Office, Gaithersburg, MD. Order Number DE81903698.

Report to the Congress by the Comptroller General of the United States.

Despite the significant increase during the 1970s of leasing Outer Continental Shelf lands for oil and gas development, accelerated leasing goals were not met. Environmental issues and limited industry interest in the areas proposed for leasing were two major factors that affected achievement of these goals. Current plans call for further increases in leasing through 1985. However, the controversial leasing issues of the 1970s continue and may limit attainment of these goals. Interior should continue with its efforts to offer more land for lease and to streamline the planning process for holding lease sales.

0220 Transport, Pipelines, And Handling

REFER ALSO TO CITATION(S) 26843

0230 Properties

REFER ALSO TO CITATION(S) 27502

0240 Storage

REFER ALSO TO CITATION(S) 27081

26846 **(SAND—80-7141) Strategic Petroleum Reserve (SPR) geological site characterization report, Sulphur Mines Salt Dome: Section I, Section II, and Section III.** Whiting, G.H. (ed.). (Sandia National Labs., Albuquerque, NM (USA)). Dec 1980. Contract AC04-76DP00789. 340p. NTIS, PC A15/MF A01. Order Number DE81026956.

The report comprises three sections: Sulphur Mines cavern stability issues; geological site characterization for Sulphur Mines SPR site in Sulphur, Louisiana (main body of report); and salt properties for Sulphur Mines Dome (no data given). The second section covers the geology and hydrology of the region, site, caprock, and salt dome, and geologic and hydrologic hazards. (DLC)

0250 Combustion

REFER ALSO TO CITATION(S) 26810

03 NATURAL GAS

26847 **PCGA proceedings.** San Mateo, CA; Pacific Coast Gas Association, Inc. (1979). 100p. (NP—1902517).

The proceedings carries a very brief abstract, or summary, of each presentation made throughout the year, providing a paper was available.

0301 Reserves

26848 **(DOE/MC/10389—T2) Evaluation of Devonian shale potential in Illinois, Indiana, and western Kentucky.** (Tetra Tech, Inc., Columbus, OH (USA)). 1981. Contract AC21-79MC10389. 43p. (DOE/METC—124). NTIS, PC A03/MF A01. Order Number DE81023751.

Potential natural gas resources in the New Albany Shale of the Illinois basin may be related to five key factors: relative organic content of the shale; relative thickness of the organically-rich shale; thermal maturity as related to depth of burial; presence of natural fractures; and type of organic matter. The shale that is organically richest is in southeastern Illinois and in most of the Indiana and Kentucky portions of the Illinois basin. The shales are thickest (about 400 feet) near the center of the basin in southeastern Illinois, southwestern Indiana, and adjacent parts of Kentucky. The area is deeply buried by younger rocks, and the organic matter has the highest thermal maturity. In addition, natural fault-induced fractures in the shale, which may aid in collecting gas from a larger volume of shale, may be present, since major faults along the Rough Creek Lineament and Wabash Valley Fault System cross the deeper part of the basin. Thus, this area near the basin center where the shale is thickest and rich organically and where fault-induced fractures may be present has the greatest potential for natural-gas resources. The eastern side of the basin, where the shale is organic-rich but thin, may have poor to moderate potential for additional discoveries of small gas fields similar to those found in the past. In western Illinois and the northern part of the basin, the potential is poor, because the organic content of the dominantly greenish-gray shale in this area is low. More exploration will be required to properly evaluate potential resources of natural gas that may exist in the New Albany Shale.

0302 Geology And Exploration

REFER ALSO TO CITATION(S) 27070

0303 Drilling, Production, And Processing

26849 **(DOE/MC/16283—T1) Integration, interpretation and evaluation of results in a multi-well interference test project. Monthly technical report.** Alam, J. (Science Applications, Inc., Morgantown, WV (USA)). Jun 1981. Contract AC21-81MC16283. 19p. NTIS, PC A02/MF A01. Order Number DE81025184.

The objective of this contract is to analyze interference test data in order to determine in situ flow properties of Devonian Shale reservoirs. During this reporting period, the build-up interference test was completed and the drawdown interference test was initiated. Pressure responses in the middle and top zones of Well No. 10056A brought attention to the observation of surrounding wells located 1700 to 3000 feet distance from the control well. A careful study was conducted to determine variations in the rate of pressure decrease before the drawdown interference tests. When

the rate of pressure drop in the middle and top zones of Well No. 10056A remained at 1.5 psi/day for several days, it was decided that the drawdown interference test data would be suitable for analysis and that it would not be necessary to shut-in the surrounding wells and wait for another long period for the reservoir to stabilize. The drawdown phase of the interference test was initiated at 5:30 p.m. on Tuesday, June 9, 1981. As planned, during the drawdown interference test a constant wellhead pressure of 240 psi was maintained using a back-pressure regulator. Due to daily variations in temperature, constant wellbore pressure could not be maintained with this equipment, but would be within a range of 5 psi above and below. Pressure response in the top zone of Well No. 10056A is approaching control well pressure.Initial analysis of the drawdown interference data was undertaken using type curve matching techniques. A new type curve reported in the previous monthly report needs modification to take into account the constant pressure interference test. The previous type curve technique was based on a constant sand face flow rate interference test. Additional effort has been given to the development of a new type of technique using the same equation, incorporating different boundary conditions.

0305 Health And Safety

REFER ALSO TO CITATION(S) 26840, 26841, 26843, 26852, 27641

0306 Marketing And Economics

REFER ALSO TO CITATION(S) 27077, 27228

26850 (DOE/TIC—1025490) Intrastate natural gas market analysis. Technical topical report, 1 December 1978-20 March 1979. Hardy, E.F. (Jensen Associates, Inc., Washington, DC (USA)). Mar 1979. Contract EI-78-C-01-6544. 78p. NTIS, PC A05/MF A01. Order Number DE81025490.

Results are summarized of a survey of intrastate natural gas markets in Texas, Louisiana, Oklahoma, New Mexico, and Kansas. The purpose of the survey was to provide an analysis of the usefulness of available data for determining whether a comprehensive market study for major intrastate gas-producing states is feasible. The results of these analyses will be utilized to decide how the DOE will proceed to increase the government's knowledge of recent intrastate gas-supply and -consumption patterns and how these components will change in the future.

0307 Waste Management

REFER ALSO TO CITATION(S) 27078

0308 Environmental Effects

REFER ALSO TO CITATION(S) 26840, 26841, 26843, 27641

26851 (FERC/EIS—0024D) Rocky Mountain pipeline project: draft environmental impact statement. (Federal Energy Regulatory Commission, Washington, DC (USA). Office of Pipeline and Producer Regulation; Bureau of Land Management, Denver, CO (USA); Rocky Mountain Pipeline Co., San Francisco, CA (USA)). Jul 1981. 305p. NTIS, PC A14/MF A01. Order Number DE81027683.

The Environmental Impact Statement (EIS) presents facts pertaining to the construction, operation, and maintenance of the Rocky Mountain Pipeline Project and any alternatives or variations to this proposed action and analyzes environmental impacts which they cause. It provides pertinent information in sufficient detail for the public to understand the project and for the decisionmaker to make a knowledgeable decision. The EIS has been prepared according to the requirements of the National Environmental Policy Act of 1969 (NEPA) and the Council on Environmental Quality's regulations for implementing NEPA, effective July 30, 1979. There are six chapters: five are in the draft EIS; the sixth - containing comments on the draft EIS - will be added for the final EIS. In addition to these chapters, there are appendices containing additional material to supplement information in the EIS chapters and technical reports which contain data supportive to the EIS. The five chapters in this volume cover the following: purpose of and need for proposed action; proposed action and alternatives; affected environment - proposed action and alternatives; environmental consequences - proposed action and alternatives; and conclusions, recommendations, and preferred alternative - FERC environmental staff conclusions and recommendations, and land managing agencies preferred alternative.

26852 (MTR—81W77, pp 341-379) **Liquefied energy gases.** Jul 1981. NTIS, PC A99/MF A01.

In Health and environmental effects of oil and gas technologies: research needs.

A great deal of controversy has surrounded the liquefied energy gas industry, particularly the liquefied natural gas (LNG) industry, for several decades. Many relevant studies have been conducted, although a total, integrated study of the entire industry has not been performed. A well structured and rigorous risk assessment is needed which would deal comprehensively with current and projected LNG imports, domestic production, LNG transportation and handling operations and movement patterns, and the probability of sabotage. Cooling water discharges from liquefaction facilities are an environmental problem. Research should be directed toward the following areas: finding beneficial uses for the waste heat, determining the capacity of aquatic biota to assimilate biocides and other cooling water additives, and evaluating the use of air as a heat sink.

26853 (MTR—81W77, pp 605-636) **Unconventional resources.** Jul 1981. NTIS, PC A99/MF A01.

In Health and environmental effects of oil and gas technologies: research needs.

Few health and environmental effects studies related to the various unconventional energy technologies have been performed. In this section, relevant research needs are discussed along with effects issues associated with each of the technologies. Of overriding and critical importance with respect to these emerging technologies is the need to exchange information among researchers and project managers associated with technological development. The techniques proposed for recovering oil from US tar sands are also applied to recovery of deep light oils and heavy oils, as well as enhanced recovery of oil shale by in situ techniques. Some heavy oils are produced in California and Texas by thermal methods (and are included in conventional oil reserve estimates). Gas from geopressured brines, eastern shales, western tight sands, and deep basins is expected to be extracted through the application of fracturing and use of drilling muds - methods that are also employed to recover the resources named above. The resources discussed in this section are classified by various Federal agencies under different programs, depending upon the agency's convenience and statutory mandates, pricing categories for the resource, and definitions of conventional versus unconventional resources. As an example, research in support of heavy oil may be categorized as conventional crude oil research by one agency and as support of synthetic fuels development by another (the Energy Security Act classifies undeveloped heavy crude as a synthetic fuel). As a result, many duplicative development and research strategies are taking place. Health and environmental research would often apply to several technologies. An information transfer strategy is needed which will enable relevant generic, regional, and process-specific research to be brought to bear on solving similar oil and gas health and environmental effects problems.

26854 Caribou (rangifer tarandus) encounters with pipelines in northern alaska. Hanson, W.C. (Battelle Pacific Northwest Labs, Wash). *Canadian Field Naturalist ;* **95**: No. 1, 57-62(Jan-Mar 1981).

The behavior of caribou upon encountering an experimental gas pipeline berm in northern Alaska was monitored. Responses of the animals indicate that a visual barrier greater than 1.2 m above groundlevel had a pronounced effect of deflecting the movements of caribou. Animals readily traversed lower berms but avoided higher berms and thermokarst areas.

0309 Artificial Stimulation

26855 (LA-UR—81-1827) KRAK model of fluid-driven fracture propagation in permeable rock. Travis, B.J. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 9p. (CONF-810518—8). NTIS, PC A02/MF A01. Order Number DE81025294.

From Joint SPE/DOE symposium; Denver, CO, USA (27 May 1981).

A model for calculating fluid-driven fracture propagation in permeable, elastic media is described. Flow in the fracture can range from small to very large Reynold's numbers. Heat and mass transport in the crack and in the surrounding porous matrix are both computed. Crack shape at each time instant is determined from Sneddon's integral and crack extension is controlled by the stress intensity integral. Flow in the crack and crack shape are fully coupled. The model has been used to show the dependence of crack propagation on material properties such as permeability and fracture toughness, on in-situ stresses and source pressure history, and on other properties. 16 figures.

26856 (NP—1903585) Methane recovery from New Mexico coals. Williams, F.L.; Smith, D. (New Mexico Univ., Albuquerque (USA). Dept. of Chemical and Nuclear Engineering). Jun 1981. 236p. (EMD—2-67-3120). Univ. of New Mexico, New Mexico Energy Inst., Albuquerque. Order Number DE81903585.

Using a newly developed technique, the methane content of 30 coal samples from 14 different sites in the San Juan Basin has been determined. The chip-desorption technique is faster and significantly cheaper than traditional, core-sample based delineation of coal bed methane. The methane content of the Fruitland coals in the San Juan basin was found to range from 1 to 6 cc/g without correction for shale that may be collected along with the coal. Laboratory studies have been initiated to determine the accuracy of a lost-gas correction scheme that is required to account for the rapid gas-desorption from these coal chips. Early results appear to show that the correction model is followed for the first 25 to 50 percent of the gas desorption for wet coals. The effects of surface diffusion and bimodal pore structure on the total gas desorption rate are being investigated in order to develop a physically realistic model that is applicable to long-term production models. Adsorption studies have shown that the methane storage is associated with the micropore (< 20 A) structure of the coal.

26857 (UCRL—84988) Multiple fracturing of boreholes using tailored-pulse loading. Swift, R.P.; Kusubov, A.S. (Lawrence Livermore National Lab., CA (USA)). 7 May 1981. Contract W-7405-ENG-48. 27p. (CONF-810518—9). NTIS, PC A03/MF A01. Order Number DE81027132.

From Joint SPE/DOE symposium; Denver, CO, USA (27 May 1981).

Laboratory experiments were conducted to study intermediate loading rates. Observations on samples of a medium-porosity sandstone showed that the degree of multiple fracturing is quite sensitive both to the condition of the borehole as well as to the loading rate and appears strongly influenced by transient pore-pressure effects. The loading rate for the onset of multiple fracturing decreased with an increase in sample water content. The influence of water was much more marked at loading rates below 30 MPa/ms than at higher rates. For loading rates above the onset, the number of fractures initiated increased with an increase in loading rate, with about 10 to 12 at a loading rate of 100 MPa/ms. The fracture threshold-breakdown pressure increased proportionately with the loading rate, a dependence that is attributed to transient water intrusion effects around the borehole. The effect of sample confinement caused the threshold-breakdown pressure to increase and noticeably lowered the loading rate for multiple-fracture onset. Only two fractures (i.e., a typical hydrofracture) occurred when water was prevented from invading the borehole region. 10 figures.

0310 Legislation And Regulation

REFER ALSO TO CITATION(S) 26844, 26845

26858 (EMD—81-27) Natural gas plan needed to provide greater protection for high-priority and critical uses. (General Accounting Office, Washington, DC (USA)). 23 Mar 1981. 56p. General Accounting Office, Gaithersburg, MD. Order Number DE81903692.

Report to the Congress by the Comptroller General of the United States.

The Department of Energy should clearly communicate that its short-term program to encourage oil burning industries and utilities to switch to natural gas is not a departure from overall efforts to discourage the use of natural gas as a boiler fuel. Natural gas supplies appear to be sufficient to support the program in the short-term. However, GAO believes that greater assurance should be provided so that natural gas will be available for high-priority and critical uses over the mid- and long-terms until substitutes are developed or the transition to alternates is feasible.

26859 Influence of environmental permitting in the 1980's. Craig, J.M. El Paso, TX; El Paso Natural Gas Company (1980). 14p. (CONF-8003142—5).

From Pacific Coast Gas Association operating section transmission conference; Salt Lake City, UT, USA (31 Mar 1980).

Disturbing trends in the environmental permitting area which could hamper development, production, and delivery of natural gas supplies in the 1980's are discussed. The complex environmental regulatory process of the 1970's will be just as difficult in the 1980's. EPA's role as a bureaucracy with an extraordinary amount of power over virtually every industrial activity in the US, will be more persuasive. Industry's involvement with the government on the issue of the environment must be tailored to develop procedures and regulations that will maximize proper decisions in the minimum time. The Clean Air Act, scheduled for renewal in 1981, must be revised and this can only be successful if we develop the necessary data to convince Congress that the Act must be loosened up. All signs point to a difficult struggle between the energy industry and environmentalists over development of a synfuels industry. Hazardous wastes and toxic substances are going to receive significant regulatory emphasis during the 1980's. As far as controlling these materials is concerned, EPA is just getting started. This is a major undertaking that is going to affect American industry probably more than any other regulatory activity to date. Demands will continue for designation of more wilderness areas. The federal government will continue to be pressured to set aside vast acreage to preserve our heritage. Unfortunately, natural gas development will be excluded from these areas, exacerbating a continued shortage through the 1980's. Concern about the costs of environmental regulations is probably at an all-time high because the costs have not been balanced against the benefits.

0320 Transport, Pipelines, And Handling

REFER ALSO TO CITATION(S) 26843, 26851

0340 Combustion

REFER ALSO TO CITATION(S) 27119

04 OIL SHALES AND TAR SANDS

0401 Reserves And Exploration

REFER ALSO TO CITATION(S) 26848

0404 Oil Production, Recovery, And Refining

REFER ALSO TO CITATION(S) 26866, 27381

26860 (DOE/EV/10298—T1, pp 396-414) **Changes in iron minerals during oil-shale retorting.** Williamson, D.L.; Melchior, D.C. (Colorado School of Mines, Golden). 1981. NTIS, PC A18/MF A01.

From 13. oil shale symposium; Golden, Colorado (USA) (April 1980).

From the Moessbauer studies, the iron minerals found in the raw shales are ankerite and pyrite and minor amounts of pyrrhotite. In the Tosco II, Fischer Assay, and Lawrence Livermore Run S-9 processes, where the retorting was done in the absence of oxygen, pyrite decomposes to form pyrrhotite but the ankerite remains unchanged. This decomposition reaction occurs at temperatures below the normal decomposition temperature of 750°C. In the Paraho retort and in Lawrence Livermore Run S-7, where oxygen was introduced into the retorting, the decomposition of the pyrite was retarded but the ankerite decomposed to iron oxides. In the two retorting processes where the temperatures exceeded 750°C, pyrite, pyrrhotite, and ankerite have all been decomposed to iron oxides. The iron was not found in silicate minerals in any of retorted shales. In these samples, the decomposition products are iron oxides and these oxides do not react with quartz to form silicates. 5 figures, 3 tables.

26861 (EPRI-WS—79-238(Vol.1), pp Section 16, 16.1-16.23) **Union Oil's shale oil demonstration plant.** Dhondt, R.O.; Duir, J.H. May 1981. NTIS, PC A18/MF A01.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

Union Oil Company of California pioneered the development of upflow surface retorting technology. Technical feasibility of the shale upflow concept was demonstrated in a small 2 T/D pilot retort nearly 35 years ago. This work was followed by the construction and operation of a 50 T/D unit, later scaled to semi-works size in the late 1950's at Union's site near Parachute, Colorado. This effort, in which retorting rates up to 1200 T/D were attained, further demonstrated the technical feasibility and operating reliability of this retorting scheme. However, shale oil production was not economically attractive at that time. In 1972, Union again initiated a major shale development program. The incentives for this work were based on new retorting concepts from our continuing research and the increasing costs of finding incremental petroleum supplies. In summary, upflow retorting as employed in Union's B retorting technology using indirect heating with a circulating gas stream has several major important advantages which include: (1) oil liberated from the shale is forced downward rapidly toward cooler shale by the countercurrent gas flow. This quenches polymerization reactions which form heavy oil that is difficult to refine; (2) gravity assists drainage of oil away from the retorting zone and avoids refluxing and coking of the product oil; (3) retorting takes place near the top of the retort where contact pressure between particles is a minimum. As a result, agglomeration and gas flow pressure drop buildup can be avoided regardless of the richness of the shale feed; and (4) the high heat capacity of the recycle gas and high gas/solids heat transfer rates combined with positive solids flow permit retorting at exceptionally high solids mass velocities.

26862 (EPRI-WS—79-238(Vol.1), pp Section 17, 17.1-17.29) **Oil shale: a developing industry.** McDermott, W.F. (Occidental Oil Shale, Inc., Grand Junction, CO). May 1981. NTIS, PC A18/MF A01.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

The development of an oil shale industry as called for by the President is one of a number of actions we need to take to protect our economy. The security of our country, our lifestyle, and our economy are geared to liquid fuels. The US oil shale deposits should provide a competitively priced, long term, environmentally benign, domestic oil supply. Little R and D was conducted in the United States until World War II. In 1944, out of concern for the hazards of imported energy, Congress passed the Synthetic Liquid Fuels Act, which authorized US Bureau of Mines (USBM) to establish a liquid fuel supply from domestic oil shale. USBM began a comprehensive R and D program that has continued to the present day. One of USBM's most significant early acts was the establishment of a research facility at Anvil Points near Rifle, Colorado. In 1965, the facility was leased by the Colorado School of Mines Research Foundation, and was the site of a 4-year development program in which the gas combustion retort was evaluated and improved by a consortium of six major oil companies: Mobil, Humble, Continental, Pan American, Phillips, and Sinclair. In 1973, the facility was leased by Development Engineering, Inc., which operated it for 5 years during which the Paraho retorting process was developed. Between 1963 and 1968, DOE evolved a leasing proposal intended to encourage private development of the federal oil shale lands in the Green River formation. The program failed to attract private participation. In addition to these activities on federal lands, private companies have also engaged in exploration and R and D programs on their own lands. The companies most heavily involved are Union Oil, Occidental Petroleum, Superior Oil Company, and the Colony Development Operation group which has included Tosco, Atlantic Richfield, Cleveland Cliffs Iron Co., Sohio, and more recently, Exxon.

26863 (ORNL/TM—7612, pp 146-151) **Oil shale.** Jul 1981. NTIS, PC A09/MF A01.

In Advanced research and technology development fossil energy materials program plan for FY 1981.

The materials requirements for the in-situ and above-ground retorting of oil shale are surveyed. (DLC)

26864 **(UCID—16986-81-1) Lawrence Livermore National Laboratory oil shale project. Quarterly report, January-March 1981.** Rothman, A.J. (ed.). (Lawrence Livermore National Lab., CA (USA)). Jun 1981. Contract W-7405-ENG-48. 35p. NTIS, PC A03/MF A01. Order Number DE81025926.

Reported are: MIS pilot retorts (runs S-24, S-21, and S-23), laboratory research (gas evolution kinetics, sulfur content of oil shales and its release during oxidation, heat of combustion of spent shale), above ground retorting (fluidized bed studies, Paraho shale oil analysis), and analysis of multiple gas-solid reactions during the gasification of char in oil shale blocks. 16 figures, 6 tables. (DLC)

0405 Properties And Composition

REFER ALSO TO CITATION(S) 27243

26865 (DOE/EV/10298—T1, pp 219-231) **Analytical laboratory.** Meglen, R.R. (Univ. of Colorado, Denver). 1981. NTIS, PC A18/MF A01.

In Oil shale research and coordination. Progress report, 1980-1981.

Approximately 8000 chemical determinations were performed on 1000 samples during the past year. Methods development work and evaluation of Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES) was begun. This technique has been introduced for routine determination of about 20 trace elements in a variety of sample types. We have implemented routine Ion Chromatography (IC) procedures for the determination of anion species in aqueous samples. The introduction of two new analytical techniques (ICP-AES and IC) have permitted in-house multi-method evaluations of analytical techniques for analysis of shale related materials. A detailed analytical procedures manual is being prepared for distribution to interested parties. 7 figures.

26866 (DOE/EV/10298—T1, pp 392-395) **Chemical analysis of inputs and outputs of oil shale retorts.** Wildeman, T.R.; Melchior, D.C.; Laffoon, A.M. (Colorado School of Mines, Golden). 1981. NTIS, PC A18/MF A01.

In Oil shale research and coordination. Progress report, 1980-1981.

This year two research objectives were actively pursued. The most important objective is to finish the research on the Paraho Retort by June 1, 1981. The other research objective is to start to study the mineralogy of raw and spent shales. This report provides a detailed discussion on the iron mineralogy of raw and

spent shale as determined by Moessbauer spectroscopy. The research on the Paraho Retort is summarized in this report.

0407 Health And Safety

REFER ALSO TO CITATION(S) 27812, 27814

26867 **(CONF-810676—1) Chemistry and mutagenicity of shale oil.** Guerin, M.R.; Ho, C.H.; Rao, T.K.; Epler, J.L. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 12p. NTIS, PC A02/MF A01. Order Number DE81023196.

From 2. joint US-USSR workshop on the health and environmental effects of oil shale development; Tallinn, USSR (22 Jun 1981).

The chemical class distribution of bacterial mutagens in a shale oil is compared to that from a petroleum crude oil and those from two coal-derived oils. Mutagenicity is found to be due to alkaline and neutral-polar polycyclic aromatic compounds in all cases. The greater mutagenicities of the petroleum substitutes is due to the presence of larger quantities of heteroatom-containing polycyclic aromatics.

26868 **(DOE/EV/10298—T1) Oil shale research and coordination. Progress report, 1980-1981.** Chappell, W.R. (Denver Univ., CO (USA). Center for Environmental Sciences). 1981. Contract AC02-79EV10298. 438p. NTIS, PC A18/MF A01. Order Number DE81015210.

Purpose is to evaluate the environmental and health consequences of the release of toxic trace elements by an oil shale industry. Emphasis is on the five elements As, Mo, F, Se, and B. Results of four years' research are summarized and the research results over the past year are reported in this document. Reports by the task force are included as appendices, together with individual papers on various aspects of the subject topic. Separate abstracts were prepared for the eleven individual papers. A progress report on the IWG oil shale risk analysis is included at the end of this document. (DLC)

26869 **Occupational health study of Paraho oil shale workers.** Rudnick, J.; Voelz, G.L. (Los Alamos Scientific Lab., NM). pp 491-499 of Health implications of new energy technologies. Rom, W.N.; Archer, V.E. (eds.). Ann Arbor, MI; Ann Arbor Science Publishers, Inc. (1980).

From Health implications of the new energy technologies; Park City, UT, USA (4 Apr 1979).

During August 1978, comprehensive health evaluations were obtained on 87 of the 92 employees of the DEI/Paraho oil shale facility in western Colorado. This project was a joint undertaking of the American Petroleum Institute and the Los Alamos Scientific Laboratory of the Department of Energy. The comprehensive health evaluations revealed DEI/Paraho employees to be in generally good health. No chronic or acute disease was found that could be attributed to exposure to oil shale or its products. The occurrence of a significant number of lost-time job injuries during the 12 months prior to the study points out job-incurred trauma as a major health effect for workers in the developing oil shale industry.

0410 Enviromental Aspects

REFER ALSO TO CITATION(S) 26853, 26868, 27694

26870 (DOE/EV/10298—T1, pp 114-131) **Microbial thiosulfate oxidation and its effect on the quality of water in oil shale retorting.** Brierley, C.L.; Brierley, J.A. (New Mexico Institute of Mining and Tech., Socorro). 1981. NTIS, PC A18/MF A01.

In Oil shale research and coordination. Progress report, 1980-1981.

From studies on the development of heterotrophic and autotrophic, thiosulfate-oxidizing bacteria in enrichment and selective madia from 30 diverse oil shale samples it is clearly evident that potential exists for microbial thiosulfate oxidation and the concomittant side reactions of pH decline and possible pollutant solubilization. Column leaching studies currently underway will identify quantitatively the extent of acid production in selected retorted and raw oil shales and concomittant trace element mobilization. pH decrease in oil shale samples and leachates is clearly dependent on the chemistry. Acid-consuming material may in fact be present in some samples in such concentrations as to neutralize the acid produced by biological oxidation of thiosulfate. In other samples biological acid production may reduce alkalinity and in effect aid in restoration of water quality. 10 tables.

26871 (DOE/EV/10298—T1, pp 132-148) **Nutrient effects on microbial mobilization of arsenic from retorted oil shale.** Klein, D.A. (Colorado State Univ., Fort Collins); Hassler, R.; Meglen, R.R.; Sistko, R. 1981. NTIS, PC A18/MF A01.

In Oil shale research and coordination. Progress report, 1980-1981.

It appears that with nutrient additions and subsequent microbial growth, changes in arsenic mobilization can occur involving both volatile and supernatant forms. With carbon (glucose) additions to shales, some increases in microbial populations occurred, suggesting that retorted shale, to a limited extent, was able to serve as a nitrogen source for microbial growth. With nitrogen additions (ammonium nitrate), no major increases in microbial populations occurred indicating that retorted shale is a particularly poor source of carbon for microbial growth. High supernatant arsenic levels appear to be related to low levels of bacterial and fungal biomass as seen in control and nitrogen-amended slurries. The trapping and analysis methods employed appear to be satisfactory for monitoring the release of volatile arsenicals from soil and retorted shale samples. Under aerobic and anaerobic conditions, microbial growth on retorted shale with added DMA and nutrients can lead to the release of arsenic forms at levels of 152.0 ug/100 g shale and 7.0 ug/100 g shale after three weeks, respectively. With aerobic conditions and nutrient amendments to retorted shale without added DMA, release of volatile arsenic forms at levels of 2.8 ug/100 g shale has been detected after three weeks. These results suggest that in the presence of organic substances, either as a result of plant growth or surface water penetration into abandoned retorts, arsenic volatilization may be able to take place.

26872 (DOE/EV/10298—T1, pp 149-164) **Adsorption of mercury by soils from oil shale development areas in the Piceance Creek Basin of Western Colorado.** Matoske, C.P.; Klusman, R.W. (Colorado School of Mines, Golden). 1981. NTIS, PC A18/MF A01.

In Oil shale research and coordination. Progress report, 1980-1981.

The soils studied show a high affinity for elemental Hg^0. Under both types of exposure, Hg^0 and HgO, ridge-top soils were found to adsorb higher amounts of Hg vapor than did the valley-floor soils. Results from the physical and chemical studies reveal higher amounts of amorphous material in ridge-top soils. A strong correlation between reducible manganese oxides and adsorbed Hg was found to exist. This suggests that Mn-oxide coatings may be the controlling factor in the observed behavior of Hg^0 adsorption. Results from this study indicate that Piceance Creek Basin soils will serve as one possible mechanism in the removal of atmospheric Hg vapor present in the off-gas of retorting facilities. However, further work is needed in the investigation of the atmospheric dispersion of Hg before its full environmental impact can be ascertained. Data presented on the background Hg concentration differences between cultivated and noncultivated soils shows that significant differences do exist. 6 tables, 7 figures.

26873 (DOE/EV/10298—T1, pp 165-196) **Concentration of chemical elements in plants growing on retorted oil shales.** Schwab, A.P.; Smith, P.J.; Lindsay, W.L. (Colorado State Univ., Fort Collins). 1981. NTIS, PC A18/MF A01.

In Oil shale research and coordination. Progress report, 1980-1981.

During the past year we completed a second season of analyses investigating plant uptake of many elements as affected by depth of soil covering retorted oil shale. Data from the 1979 sampling season demonstrated that the potentially toxic elements (selenium, arsenic, lead, cobalt, and chromium) were not accumulated by the plants to any significant extent. Plant concentrations of boron were approaching phytotoxic levels but showed no effect of

soil cover. Uptake of the nutrient elements also showed no effects of soil cover. Some of the nutrient elements' concentrations appears to be very low. Elevated levels of molybdenum were observed in several of the plant species, and molybdenum concentrations decreased with increasing soil cover. The copper-to-molybdenum ratio of the plants was low but increased with increasing soil cover. A second year of sampling was conducted to observe trends in uptake by these plants as their roots began penetrating the shale beneath the soil. 20 figures, 5 tables.

26874 (DOE/EV/10298—T1, pp 197-217) **Effect of boron on plants growing in retorted oil shale.** Smith, P.J.; Schwab, A.P.; Lindsay, W.L. (Colorado State Univ., Fort Collins). 1981. NTIS, PC A18/MF A01.

In Oil shale research and coordination. Progress report, 1980-1981.

Elevated levels of several trace elements have been found in both retorted oil shale and plants growing thereon. Boron (B) and molybdenum (Mo) are of particular concern in this respect. Available B levels appear to be high enough to pose problems in establishing plants on retorted shale sites, while excessive uptake of Mo by plants may reduce the quality of forage and impose hazards to grazing livestock. A greenhouse study was set up to investigate the uptake of B and subsequent yield of plants growing on direct retorted Paraho shale to which various levels of B were added. Another study was undertaken to examine the solubility and fate of added B to retorted oil shale. 15 figures, 3 tables.

26875 (DOE/EV/10298—T1, pp 232-252) **Mathematical modeling and transport mechanisms for leaching of spent oil shale.** Ramirez, W.F. (Univ. of Colorado, Boulder). 1981. NTIS, PC A18/MF A01.

In Oil shale research and coordination. Progress report, 1980-1981.

A characterization was made of the porous media properties of spent oil shale. Studies have been conducted for Tosco Powders, Paraho Powders, Paraho Consolidated Chunks, and Tosco Pellets made from powdered material. The following properties have been determined: pore size distributions using mercury porosimetry experiments, total surface area per gram of material using BET nitrogen adsorption and mercury porosimetry experiments, and visual and chemical analysis by scanning electron microscopy and x-ray elemental spectroscopy. Design and construction of an injection controlled dynamic leaching experiment is reported that obtains simultaneously both leachate breakouts as well as tracer treakouts to determine dynamic changes in porous media properties along with pollutant levels. Leaching capacity of spent shales was determined by measurement of an equilibrium exchange isotherm for sulphate, carbonate, sodium, calcium, strontium, boron and fluoride.

26876 (DOE/EV/10298—T1, pp 253-306) **Release, transport, and fate of potential pollutants.** Runnells, D.D.; Esmaili, E. (Univ. of Colorado, Boulder). 1981. NTIS, PC A18/MF A01.

In Oil shale research and coordination. Progress report, 1980-1981.

During the past year we have pursued four major areas of investigation. First, we obtained and characterized a new set of shales and corresponding leachates, for the purpose of future studies on the sorption of dissolved contaminants in the leachate on soils and rocks of the Piceance Creek Basin. Second, we began the investigations of the interaction between leachates and a variety of solid geologic substrates from the oil shale region. Third, we identified and began to define the potential danger posed by the layer of capillary salts that forms on the surfaces of the piles of waste shale. And fourth, we devised a new experimental technique and began a study of the importance of diffusion in controlling the chemical composition and homogeneity of leachates from columns of waste shale. The computer modeling has resulted in a better understanding of the identity of the dissolved species in leachate and the solid compounds that may either precipitate or dissolve in oil shale leachate. 11 figures, 3 tables.

26877 (DOE/EV/10298—T1, pp 307-391) **Trace elements and organic ligands in oil shale wastes.** Stanley, J.; Conditt, M.; Sievers, R.E. 1981. NTIS, PC A18/MF A01.

In Oil shale research and coordination. Progress report, 1980-1981.

The wastewaters from oil shale retorting operations are complex mixtures of hydrophobic and hydrophilic organic solutes, inorganic salts, and trace elements. Measurements of dissolved organic carbon showed the proportions of acid, base, and neutral subfractions are very different for three different processes. Organic compounds identified by fused silica capillary chromatography included phenol, alkyl-substituted phenols, n-C_6-C_{12} carboxylic acids, methylpyridines, dimethylpyridines, trimethylpyridines, aniline, substituted anilines, quinoline, isoquinoline, methyl-, and dimethyl-substituted quinolines. Measurements of the abilities of the compounds to form complexes with Cu(II) were made. The complexing ability of the three wastewaters compares well with the dissolved organic carbon concentration. The complexing ability decreases in the order: above-ground retort >> a true in-situ > retort water from a modified in-situ operation. Arsenic can be removed effectively from the above-ground retort wastewater by percolating it through the retorted shale. The retorted shale was also effective in reducing color and odor from the true in-situ retort waters. Selenium, initially abundant in the wastewater from an above-ground process, was not adsorbed. Molybdenum was leached from the spent shale with all three wastewaters and with distilled, deionized water. Adsorbent separation, liquid-liquid extraction, and steam distillation provide class fractionation of the organic solutes in the wastewaters. Size fractionation and ion exchange experiments indicated that the majority of trace elements in a true in-situ retort water are present as small hydrated ions or as labile organic or inorganic complexes. 19 figures, 19 tables.

05 NUCLEAR FUELS

0501 Reserves

REFER ALSO TO CITATION(S) 27439

0502 Exploration

26878 **(GJBX—116(81)) Engineering report on drilling in the quartz-pebble conglomerates in southeast Wyoming.** McCaslin, J.L. (Bendix Field Engineering Corp., Grand Junction, CO (USA)). May 1981. Contract AC13-76GJ01664. 128p. NTIS, PC E07/MF $3.50. Order Number DE81027153.

Includes 6 sheets of 48x reduction microfiche.

This report presents engineering data, statistics, and individual borehole histories of 28 holes drilled in this project. The project was drilled in two phases, with Phase I consisting of 20 holes completed in 1979 and Phase II consisting of 8 holes completed in 1980. Charts showing daily drilling progress are included in Appendix A and geophysical logs, on microfiche, are included in the pocket at the end of this report. A separate geologic report will be available through the Technical Library of Bendix Field Engineering Corporation (BFEC), PO Box 1569, Grand Junction, Colorado 81502.

26879 **(GJBX—180-81-Vol.2B) Airborne gamma-ray spectrometer and magnetometer survey: Miles City quadrangle (Montana). Final report.** (Bendix Field Engineering Corp., Grand Junction, CO (USA); High Life Helicopters, Inc., Puyallup, WA (USA); QEB, Inc., Lakewood, CO (USA)). 1981. Contract AC13-76GJ01664. 212p. NTIS, PC A10/MF A01. Order Number DE81025705.

Eighty uranium anomalies meet the minimum statistical requirements as defined in Volume I. These anomalies are tabulated and are shown on the Uranium Anomaly Interpretation Map. Potassium (%K), equivalent Uranium (ppM eU), equivalent Thorium (ppM eT), eU/eT, eU/K, eT/K, and magnetic pseudo-contour maps are presented in Appendix E. Stacked Profiles showing geologic strip maps along each flight-line, together with sensor data, and ancillary data are presented in Appendix F. All maps and profiles were prepared on a scale of 1/250,000, but have been reduced to 1/500,000 for presentation in Volume II.

26880 (GJBX—180-81-Vol.2D) Airborne gamma-ray spectrometer and magnetometer survey: Watford City quadrangle (North Dakota). Final report. (Bendix Field Engineering Corp., Grand Junction, CO (USA); High Life Helicopters, Inc., Puyallup, WA (USA); QEB, Inc., Lakewood, CO (USA)). 1981. Contract AC13-76GJ01664. 178p. NTIS, PC A09/MF A01. Order Number DE81025702.

Sixty uranium anomalies meet the minimum statistical requirements as defined in Volume I. These anomalies are tabulated and are shown on the Uranium Anomaly Interpretation Map. Potassium (%K), equivalent Uranium (ppM eU), equivalent Thorium (ppM eT), eU/eT, eU/K, eT,K, and magnetic pseudo-contour maps are presented in Appendix E. Stacked Profiles showing geologic strip maps along each flight-line, together with sensor data, and ancillary data are presented in Appendix F. All maps and profiles were prepared on a scale of 1/250,000, but have been reduced to 1/500,000 for presentation in Volume II.

26881 (GJBX—181-81Vol.1) Airborne gamma-ray spectrometer and magnetometer survey: Rockford Quadrangle, Aurora Quadrangle (IL), Madison Quadrangle (WI). Final report. (High Life Helicopters, Inc., Puyallup, WA (USA)). 1980. Contract AC13-79GJ01692. 75p. NTIS PC E10/MF $15.90. Order Number DE81026342.

Includes 68 sheets of 48x reduction microfiche.

An airborne combined radiometric and magnetic survey was performed for the Department of Energy (DOE) over the area covered by the Madison, Rockford, and Aurora, 1:250,000 National Topographic Map Series (NTMS), quadrangle maps. The survey was part of DOE's National Uranium Resource Evaluation (NURE) program. Data were collected by a helicopter equipped with a gamma-ray spectrometer with a large crystal volume, and with a high sensitivity proton precession magnetometer. The radiometric system was calibrated at the Walker Field Calibration pads and the Lake Mead Dynamic Test Range. Data quality was ensured during the survey by daily test flights and equipment checks. Radiometric data were corrected for live time, aircraft and equipment background, cosmic background, atmospheric radon, Compton scatter, and altitude dependence. The corrected data were statistically evaluated, plotted, and contoured to produce anomaly maps based on the radiometric response of individual geological units. The anomalies were interpreted and an interpretation map produced. Volume I contains a description of the systems used in the survey, a discussion of the calibration of the systems, the data collection procedures, the data processing procedures, the data presentation, the interpretation rationale, and the interpretation methodology. A separate Volume II for each quadrangle contains the data displays and the interpretation results.

26882 (GJBX—181-81-Vol.2A) Airborne gamma-ray spectrometer and magnetometer survey: Madison quadrangle (WI). Final report. (High Life Helicopters, Inc., Puyallup, WA (USA); QEB, Inc., Lakewood, CO (USA)). 1981. Contract AC13-79GJ01692. 159p. NTIS, PC A08/MF A01. Order Number DE81026362.

Five uranium anomalies meet the minimum statistical requirements as defined in Volume I. These anomalies are tabulated and are shown on the Uranium Anomaly Interpretation Map. Potassium (%K), equivalent Uranium (ppM eU), equivalent Thorium (ppM eTh), eU/eTh, eU/K, eTh/K, and magnetic pseudo-contour maps are presented in Appendix E. Stacked Profiles showing geologic strip maps along each flight-line, together with sensor data, and ancillary data are presented in Appendix F. All maps and profiles were prepared on a scale of 1:250,000, but have been reduced to 1:500,000 for presentation in Volume II. Anomaly No. 1 is over an area underlain by the Ordovician St. Peter Sandstone (Osp). Anomaly No. 2 is over an area underlain by Ordovician Galena Black River Dolomite (Og). Anomalies No. 3 to No. 5 are over areas underlain by undifferentiated Pleistocene ground moraines (Qug).

26883 (GJBX—181-81-Vol.2B) Airborne gamma-ray spectrometer and magnetometer survey: Rockford quadrangle (IL). Final report. (High Life Helicopters, Inc., Puyallup, WA (USA); QEB, Inc., Lakewood, CO (USA)). 1981. Contract AC13-79GJ01692. 182p. NTIS, PC A09/MF A01. Order Number DE81026359.

Eleven uranium anomalies meet the minimum statistical requirements as defined in Volume I. These anomalies are tabulated and are shown on the Uranium Anomaly Interpretation Map. Potassium (%K), equivalent Uranium (ppM eU), equivalent Thorium (ppM eTh), eU/eTh, eU,K, eTh/K, and magnetic pseudo-contour maps are presented in Appendix E. Stacked Profiles showing geologic strip maps along each flight-line, together with sensor data, and ancillary data are presented in Appendix F. All maps and profiles were prepared on a scale of 1:250,000, but have been reduced to 1:500,000 for presentation in Volume II. Anomaly No. 1 is over an area underlain by the Mackinaw member (Qhm) of the Pleistocene Henry formation. Anomaly No. 2 is over an area underlain by Pleistocene Cahokia Alluvium (Qc) and the Ogle Till member (Qgo) of the Glasford formation. Anomaly No. 3 is over an area underlain by the Ogle Till member (Qgo) of the Pleistocene age. Anomaly No. 4 is over an area underlain by Ordovician Galena Black River Dolomite (Og). Anomaly No. 5 is over an area underlain by the Mackinaw member (Qhm) of the Henry formation and the Capron Till member (Qwic) of the Winnebago formation of Pleistocene ages. Anomaly No. 6 is over an area underlain by the Windlow Till member (Qgw) of the Glasford formation of Pleistocene age. Anomaly No. 7 is over an area underlain by the Argyle Till member (Qwia) o the Winnebago formation of Pleistocene age. Anomaly No. 8 is over an area underlain by the Capron Till member (Qwic) of the Winnebago formation of Pleistocene age. Anomaly No. 9 is over an area underlain by the Pleistocene Carmi member (Qcl) of the Equality formation and undifferentiated ground moraine (Qug). Anomalies No. 10 and No. 11 are over areas underlain by undifferentiated ground moraine (Qug) of Pleistocene age.

26884 (GJBX—181-81-Vol.2C) Airborne gamma-ray spectrometer and magnetometer survey: Aurora quadrangle (IL). Final report. (High Life Helicopters, Inc., Puyallup, WA (USA); QEB, Inc., Lakewood, CO (USA)). 1981. Contract AC13-79GJ01692. 186p. NTIS, PC A09/MF A01. Order Number DE81026360.

Twenty-three uranium anomalies meet the minimum statistical requirements as defined in Volume I. These anomalies are tabulated and are shown on the Uranium Anomaly Interpretation Map. Potassium (%K), equivalent Uranium (ppM eU), equivalent Thorium (ppM eTh), eU/eTh, eU/K, eTh/K, and magnetic pseudo-contour maps are presented in Appendix E. Stacked Profiles showing geologic strip maps along each flight-line, together with sensor data, and ancillary data are presented in appendix F. All maps and profiles were prepared on a scale of 1:250,000, but have been reduced to 1:500,000 for presentation in Volume II.

26885 (GJBX—193-81) Hydrogeochemical and stream sediment reconnaissance basic data fro Howard Pass Quadrangle, Alaska. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). 29 May 1981. Contract W-7405-ENG-26. 104p. (K/UR—316). NTIS, PC E04/MF $3.50. Order Number DE81026179.

Includes 1 sheet of 48x reduction microfiche.

Field and laboratory data are presented for 626 water samples from the Howard Pass Quadrangle, Alaska. The samples were collected by Los Alamos Scientific Laboratory; laboratory analysis and data reporting were performed by the Uranium Resource Evaluation Project at Oak Ridge, Tennessee.

26886 (GJBX—194-81) Hydrogeochemical and stream sediment reconnaissance basic data for Prince Rupert Quadrangle, Alaska. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). 29 May 1981. Contract W-7405-ENG-26. 44p. (K/UR—317). NTIS, PC E02/MF $3.50. Order Number DE81026180.

Field and laboratory data are presented for 84 water samples from th Prince Rupert Quadrangle, Alaska. The samples were collected by Los Alamos Scientific Laboratory; laboratory analysis and data reporting were performed by the Uranium Resource Evaluation Project at Oak Ridge, Tennessee.

26887 (GJBX—195-81) Hydrogeochemical and stream sediment reconnaissance basic data for Big Delta Quadrangle, Alaska. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). 29 May 1981. Contract W-7405-ENG-26. 150p. (K/UR—323). NTIS, PC E05/MF $3.50. Order Number DE81026181.

Includes 1 sheet of 48x reduction microfiche.

Field and laboratory data are presented for 1380 water samples from the Big Delta Quadrangle, Alaska. The samples were collected by Los Alamos Scientific Laboratory; laboratory analysis and data reporting were performed by the Uranium Resource Evaluation Project at Oak Ridge, Tennessee.

26888 (GJBX—196-81) Hydrogeochemical and stream sediment reconnaissance basic data for Mt. Michelson Quadrangle, Alaska. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). 29 May 1981. Contract W-7405-ENG-26. 70p. (K/UR—331). NTIS, PC E03/MF $3.50. Order Number DE81026182.

Includes 1 sheet of 48x reduction microfiche.

Field and laboratory data are presented for 564 water samples from the Mt. Michelson Quadrangle, Alaska. The samples were collected by Los Alamos Scientific Laboratory; laboratory analysis and data reporting were performed by the Uranium Resource Evaluation Project at Oak Ridge, Tennessee.

26889 (GJBX—197-81) Hydrogeochemical and stream sediment reconnaissance basic data for Tanacross Quadrangle, Alaska. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). 29 May 1981. Contract W-7405-ENG-26. 153p. (K/UR—325). NTIS PC E06/MF $3.50. Order Number DE81026183.

Includes 1 sheet of 48x reduction microfiche.

Field and laboratory data are presented for 1400 water samples from the Tanacross Quadrangle, Alaska. The samples were collected by Los Alamos Scientific Laboratory; laboratory analysis and data reporting were performed by the Uranium Resource Evaluation Project at Oak Ridge, Tennessee.

26890 (GJBX—211(811)) Airborne gamma-ray spectrometer and magnetometer survey. (High Life Helicopters, Inc., Puyallup, WA (USA)). 1980. Contract AC13-79GJ01692. 78p. NTIS, PC E08/MF $11.00. Order Number DE81027157.

Includes 44 sheets of 48x reduction microfiche.

An airborne combined radiometric and magnetic survey was performed for the Department of Energy (DOE) over the area covered by the Toronto, Buffalo, Kingston, Rochester, and Elmira, 1:250,000 National Topographic Map Series (NTMS), quadrangle maps. The survey was part of DOE's National Uranium Resource Evaluation (NURE) program. Data were collected by a helicopter equipped with a gamma-ray spectrometer with a large crystal volume, and with a high sensitivity proton precession magnetometer. The radiometric system was calibrated at the Walker Field Calibration pads and the Lake Mead Dynamic Test Range. Data quality was ensured during the survey by daily test flights and equipment checks. Radiometric data were corrected for live time, aircraft and equipment background, cosmic background, atmospheric radon, Compton scatter, and altitude dependence. The corrected data were statistically evaluated, plotted, and contoured to produce anomaly maps based on the radiometric response of individual geological units. The anomalies were interpreted and an interpretation map produced. Volume I contains a description of the systems used in the survey, a discussion of the calibration of the systems, the data collection procedures, the data processing procedures, the data presentation, the interpretation rationale, and the interpretation methodology. A separate Volume II for each quadrangle contains the data displays and the interpretation results.

26891 (GJO—103-81) Uranium exploration expenditures in 1980 and plans for 1981-1982. Sanders, L.R. Jr. (Department of Energy, Grand Junction, CO (USA). Grand Junction Office). May 1981. 16p. NTIS, PC A02/MF A01. Order Number DE81023653.

The Grand Junction Office of the US Department of Energy has conducted annual surveys of actual and planned uranium exploration activities since 1971. This report summarizes the aggregated proprietary information which has been furnished by the industry on a confidential basis. This work is part of an overall program to evaluate future supplies of nuclear fuel. The annual surveys have covered: (1) land acquired for exploration and cost of acquisition (since 1966); (2) surface drilling footage and cost (since 1966); (3) all other exploration expenditures (since 1966); (4) estimates of exploration activities and costs for the next 2 years (since 1971), this year's survey covered estimates for 1981 to 1982; (5) year-end total of lands held for uranium exploration (since 1972); (6) exploration for nonsandstone deposits (since 1974); (7) exploration in nonestablished areas (since 1974); (8) foreign uranium exploration expenditures by US companies (since 1966); (9) foreign participation in exploration activities in the United States (since 1975); (10) aerial radiometric exploration activities (since 1977); and (11) solution mining production drilling (since 1976). This report presents a compilation of data from the replies of 147 companies.

0507 Fuels Production And Properties

REFER ALSO TO CITATION(S) 26930, 26934, 27136, 27159

26892 (HEDL-SA—2260-FP) Touch-sensitive graphics terminal applied to process control. Bennion, S.I.; Creager, J.D.; VanHouten, R.D. (Hanford Engineering Development Lab., Richland, WA (USA); Boeing Computer Services Co., Richland, WA (USA)). 1981. Contract AC14-76FF02170. 35p. (CONF-810805—4). NTIS, PC A03/MF A01.

From SIGGRAPH'81 meeting; Dallas, TX, USA (3 Aug 1981).

Limited initial demonstrations of the system described took place during September 1980. A single CRT was used an an input device in the control center while operating a furnace and a pellet inspection gage. These two process line devices were completely controlled, despite the longer than desired response times noted, using a single control station located in the control center. The operator could conveniently execute any function from this remote location which could be performed locally at the hard-wired control panels. With the installation of the enhancements, the integrated touchscreen/graphics terminal will provide a preferable alternative to normal keyboard command input devices.

0508 Spent Fuels Reprocessing

26893 (CONF-810691—1) Consolidated fuel-reprocessing program:: man/machine interface development for the REMOTEX concept. Garin, J.; Clarke, M.M. (Oak Ridge National Lab., TN (USA); Oak Ridge Associated Universities, Inc., TN (USA)). 1981. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE81024100.

From 17. annual conference on manual control; Los Angeles, CA, USA (16 Jun 1981).

This paper describes ongoing research at ORNL to develop a man/machine interface system that can be used to remotely control a system composed of a transporter base and a force-reflecting, servo-controlled manipulator. A unique feature of the concept is the incorporation of totally remote operation. Thus, a major objective is the requirement that an operator have a sense of presence in the remote environment. Man/machine interface requirements for this totally remote operation remain to be developed. Therefore, a simulator is being built to optimize such requirements and the developments are discussed.

0509 Transport And Storage

REFER ALSO TO CITATION(S) 27162, 27533, 27538

26894 (HEDL-TC—1768) Validation of the STAFF-5 computer model. Fletcher, J.F.; Fields, S.R. (Hanford Engineering Development Lab., Richland, WA (USA)). Apr 1981. Contract AC14-76FF02170. 35p. NTIS, PC A03/MF A01. Order Number DE81026193.

STAFF-5 is a dynamic heat-transfer-fluid-flow stress model designed for computerized prediction of the temperature-stress per-

formance of spent LWR fuel assemblies under storage/disposal conditions. Validation of the temperature calculating abilities of this model was performed by comparing temperature calculations under specified conditions to experimental data from the Engine Maintenance and Dissassembly (EMAD) Fuel Temperature Test Facility and to calculations performed by Battelle Pacific Northwest Laboratory (PNL) using the HYDRA-1 model. The comparisons confirmed the ability of STAFF-5 to calculate representative fuel temperatures over a considerable range of conditions, as a first step in the evaluation and prediction of fuel temperature-stress performance.

26895 **(LA-UR—1947) Using a referee to resolve shipper-receiver differences.** Tietjen, G.L. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 4p. (CONF-810706—14). NTIS, PC A02/MF A01. Order Number DE81025356.

From Institute of Nuclear Materials Management conference; San Francisco, CA, USA (13 Jul 1981).

Within the nuclear community, shipper-receiver differences generate considerable concern. Current methods of resolving these differences are discussed, prticularly the use of an umpire or referee. Numerous statistical problems connected with the present procedures are also considered.

26896 **(PNL—3463) Analysis of the risk of transporting uranium ore concentrates by truck.** Geffen, C.A. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jul 1981. Contract AC06-76RL01830. 89p. NTIS, PC A05/MF A01. Order Number DE81027520.

This report evaluates the risks involved with shipping uranium ore concentrates by truck in an attempt to provide some perspective on the system safety issues. The basic probabilistic risk evaluation methodology used in this study is similar to that employed by Pacific Northwest Laboratory (PNL) in a series of risk analyses on the transportation of potentially hazardous energy materials. The risk model has been constructed as a series of separate analysis steps to allow the system risk to be readily reevaluated as additional data become available or as postulated system characteristics change. The reslts of this analysis show that the risks to the public health and safety from yellowcake releases during a transportation accident are insignificant. Accidents involving truck shipments of yellowcake are expected to occur at a rate of about ten a year. However, only one-fifth of these accidents, or about two a year, are expected to cause a release of yellowcake to the environment. None of these accidents was estimated to produce any potential fatalities. The low concentration of radioactivity distributed throughout the material resulted in no significant increase in radiation doses above normal background levels to members of the general public.

0520 Waste Management

REFER ALSO TO CITATION(S) 26925, 26928, 27386, 27687, 27688, 27689, 27690, 27727, 27745, 27826

26897 **(CONF-8010130—7) X-ray photoemission spectroscopy and ion backscattering analysis of leached simulated waste glass containing UO_3.** Karim, D.P.; Lam, D.J. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 13p. NTIS, PC A02/MF A01. Order Number DE81023841.

From Waste-Rock Interactions Technology annual information meeting; Seattle, WA, USA (13 Oct 1980).

UO_3 has been dissolved into several complex borosilicate glasses including Battelle simulated waste glasses 76-68, 3008, and 76-101. The glass surfaces were examined before and after leaching using x-ray photoemission spectroscopy and backscattered ion beam profiling. Samples leached in distilled water showed enhanced surface layer concentrations of several elements including uranium, titanium, zinc, iron and rare earths. For the case of uranium in 76-101, a simple experiment involving leaching two glasses in the same container showed that this surface enhancement is probably not due to redeposition from solution. Similar samples behaved quite differently when leached in a pH = 3.5 nitric acid solution, showing a surface layer high in SiO_2.

26898 **(DOE/EIS—0081D) Long-term management of liquid high-level radioactive wastes stored at the Western New York Nuclear Service Center, West Valley.** (Department of Energy, Washington, DC (USA). Assistant Secretary for Nuclear Energy). Jul 1981. 326p. NTIS, PC A15/MF A01. Order Number DE81027688.

The statement assesses and compares environmental implications of possible alternatives for long-term management of the liquid high-level radioactive wastes stored in underground tanks at the Western New York Nuclear Service Center in West Valley, New York. Four basic alternatives, as well as options within these alternatives, have been considered in the EIS: (1) onsite processing to a terminal waste form for shipment and disposal in a federal repository; (2) onsite conversion to a solid interim form for shipment to a federal waste facility for later processing to a terminal form and shipment and subsequent disposal in a federal repository; (3) mixing the liquid wastes with cement and other additives, pouring it back into the existing tanks, and leaving onsite; and (4) no action (continued storage of the wastes in liquid form in the underground tanks at West Valley). Mitigative measures for environmental impacts have been considered for all alternatives. No significant stresses on supplies or irreversible and irretrievable resources are anticipated, and no scarce resource would be required.

26899 **(DOE/SR-WM—81-1) Savannah River Waste Management Program plan - FY1981.** (Department of Energy, Aiken, SC (USA). Savannah River Operations Office). May 1981. Contract AC09-76SR00001. 133p. NTIS, PC A07/MF A01. Order Number DE81025616.

This document provides the program plan as requested by the Savannah River Operations Office of the Department of Energy. The plan was developed to provide a working knowledge of the nature and extent of the waste management programs being undertaken by Savannah River (SR) contractors for the Fiscal Year 1981. In addition, the document projects activities for several years beyond 1981 to adequately plan for safe handling and storage of radioactive wastes generated at Savannah River, for developing technology to immobilize high-level radioactive wastes generated and stored at SR, and for developing technology for improved management of low-level solid wastes.

26900 **(DP—1606) Description of DWPF reference waste form and canister.** (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Jun 1981. Contract AC09-76SR00001. 54p. NTIS, PC A04/MF A01. Order Number DE81026335.

This document describes the reference waste form and canister for the Defense Waste Processing Facility (DWPF). The facility is planned for location at the Savannah River Plant in Aiken, SC, and is scheduled for construction authorization during FY-1983. The reference canister is fabricated of 24-in.-OD 304L stainless steel pipe with a dished bottom, domed head, and lifting and welding flanges on the head neck. The overall canister length is 9 ft 10 in., with a wall thickness of 3/8-in. (schedule 20 pipe). The canister length was selected to reduce equipment cell height in the DWPF to a practical size. The canister diameter was selected to ensure that a filled canister with its shipping cask could be accommodated on a legal-weight truck. The overall dimensions and weight appear to be generally compatible with preliminary assessments of repository requirements. The reference waste form is borosilicate glass containing approximately 28 wt % sludge oxides with the balance glass frit. Borosilicate glass was chosen because of its high resistance to leaching by water, its relatively high solubility for nuclides found in the sludge, and its reasonably low melting temperature. The glass frit contains approximately 58% SiO_2 and 15% B_2O_3. This composition results in a low average leachability in the waste form of approximately 5×10^{-9} g/cm^2-day based on ^{137}Cs over 365 days in 25°C water. The canister is filled with 3260 lb of glass which occupies about 85% of the free canister volume. The filled canister will generate approximately 425 watts when filled with oxides from 5-year-old sludge and 15-year-old supernate from the Stage 1 and Stage 2 processes. The radionuclide content of the canister is about 150,000 curies, with a radiation level of 2×10^4 rem/hour at 1 cm.

26901 **(ENICO—1088) Independent review panel to evaluate and review alternative waste forms to immobilize the Idaho Chemical Processing Plant (ICPP) calcined waste. Final report.** (Exxon Nuclear Idaho Co., Inc., Idaho Falls (USA); Arizona Univ., Tucson (USA). Coll. of Engineering). Jun 1981. Contract AC07-76ID01675. 42p. NTIS, PC A03/MF A01. Order Number DE81025181.

An evaluation panel was organized to aid in the selection of an appropriate solid form for the high level wastes generated by chemical processing of fuels at the Idaho Chemical Processing Plant. This report is a summary of the panel's findings. The panel agrees that the best choice is borosilicate glass because its performance is acceptable, it represents a well developed process and hence it can be implemented expeditiously. In-can melt appears to be the best process at this time, however, development may result in the continuous melt process proving to be better. Stabilized calcine in a matrix, based on the data presently available, may be acceptable. The ratings are based on performance predicted from scanty experimental evidence. If these preliminary observations stand up, the performance of stabilized calcine in fuetap should be satisfactory and the more attractive processing characteristics of this form would prevail. The glass-crystalline and the other crystalline forms have not been developed to a point demonstrating superior performances that would justify their replacing borosilicate glass. System performance improvements great enough to justify more R and D, and probable higher cost, must be also shown. An objective basis to conclude that increased leach resistance will decrease risk to humans does not now exist.

26902 **(HEDL-SA—2235) Process considerations for hot pressing ceramic nuclear waste forms.** Wilson, C.N.; Brite, D.W. (Hanford Engineering Development Lab., Richland, WA (USA); Battelle Pacific Northwest Labs., Richland, WA (USA)). 25 Mar 1981. Contract AC14-76FF02170. 25p. (CONF-810528—7). NTIS, PC A02/MF A01. Order Number DE81023183.

From 83. symposium on nucleation and crystallization in glasses; Washington, DC, USA (3 May 1981).

Spray calcined simulated ceramic nuclear waste powders were hot pressed in graphite, nickel-lined graphite and ZrO_2-lined Al_2O_3 dies. Densification, initial off-gas, waste element retention and pellet-die interactions were evaluated. Indicated process considerations and limitations are discussed. 15 figures.

26903 **(LA—8818-PR) Laboratory studies of radionuclide distributions between selected groundwaters and geologic media. Progress report, January 1-March 31, 1981.** Daniels, W.R. (comp.). (Los Alamos National Lab., NM (USA)). Jun 1981. Contract W-7405-ENG-36. 32p. NTIS, PC A03/MF A01. Order Number DE81026807.

This quarterly report presents Los Alamos National Laboratory contributions to the Waste/Rock Interactions Technology program, Tasks 3 and 4, for the second quarter of FY-1981. Much of the activity during the second quarter of FY-1981 involved studies of sorption isotherms and of migration in crushed, fractured, and porous materials. Desorption results from batch measurements of plutonium sorption ratio on granite are listed. The rate of uptake of ^{85}Sr, ^{137}Cs, ^{133}Ba, and ^{152}Eu on climax rock and stripa granite wafers is being studied. Crushed argillite column studies with ^{85}Sr and ^{137}Cs are being conducted to study batch sorption desorption ratios. Solid core column studies with tuff are also being performed. Representative sorption ratios that have been obtained by the batch, circulating-system, crushed-rock-column, and, in one case, whole-core-column methodologies for strontium, cesium, and barium are compared. The procedure for the determination of Fe(II) using 4,7-diphenyl-1, 10-phenanthroline has been tested using a Hewlett-Packard model 8450A UV/VIS spectrophotometer. Work has continued on the development of Eh buffers or moderators for use with plutonium and other actinides.

26904 **(LA—8841-MS) Review of the thermal stability and cation exchange properties of the zeolite minerals clinoptilolite, mordenite, and analcime; applications to radioactive waste isolation in silicic tuff.** Smyth, J.R.; Caporuscio, F.A. (Los Alamos National Lab., NM (USA)). Jun 1981. Contract W-7405-ENG-36. 31p. NTIS, PC A03/MF A01. Order Number DE81026686.

Silicic tuffs of the southern Great Basin and basalts of the Columbia River Plateau are under investigation as potential host rocks for high- and intermediate-level radioactive wastes. Nonwelded and partially welded tuffs may contain major amounts (> 50%) of the zeolite minerals clinoptilolite, mordenite, and analcime. Densely welded tuffs and some basalt flows may contain clinoptilolite as fracture filling that limits the permeability of these rocks. The cation exchange properties of these zeolite minerals allow them to pose a formidable natural barrier to the migration of cationic species of various radionuclides in aqueous solutions. However, these minerals are unstable at elevated temperatures and at low water-vapor pressures and may break down either by reversible dehydration or by irreversible mineralogical reactions. All the breakdown reactions occurring at increased temperature involve a net volume reduction and evolution of fluids. Thus, they may provide a pathway (shrinkage fractures) and a driving force (fluid pressure) for release of radionuclides to the biosphere. These reactions may be avoided by keeping zeolite-bearing horizons saturated with water and below about 85°C. This may restrict allowable gross thermal loadings in waste repositories in volcanic rocks.

26905 **(LA—8847-PR) Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, January 1-March 31, 1981.** Erdal, B.R.; Daniels, W.R.; Wolfsberg, K. (comps.). (Los Alamos Scientific Lab., NM (USA)). Jul 1981. Contract W-7405-ENG-36. 70p. NTIS, PC A04/MF A01. Order Number DE81026674.

Storage of radwaste in tuff was studied. Adsorption experiments were conducted with ^{85}Sr, ^{95}Tc, ^{137}Cs, ^{133}Ba, and ^{152}Eu. The geochemistry and mineralogy-petrology of tuff were studied. Organic and inorganic Eh buffers were investigated. Rock physics studies were also conducted. (DLC)

26906 **(NVO—196-24) Bibliography of the published reports, papers, and articles on the Nevada Nuclear Waste Storage Investigations.** Lorenz, J.J. (comp.). (Department of Energy, Las Vegas, NV (USA). Nevada Operations Office). May 1981. 33p. NTIS, PC A03/MF A01. Order Number DE81026959.

This document is a bibliography of the published reports, papers, and articles on the Nevada Nuclear Waste Storage Investigations (NNWSI). The bibliography is categorized by principal NNWSI participant organization; participant-sponsored subcontractor resports, papers, and articles are included in the sponsoring organization's bibliography list. The principal participant bibliography listings are arranged in chronological order by title. An author index is provided. Copies of reports and papers published for the NNWSI by the DOE and principal participant organizations are available at nominal cost from the National Technical Information Serivce, US Department of Commerce, 5285 Port Royal Road, Springfield, Virginia, 22161.

26907 **(PNL—3556) Graphite matrix materials for nuclear waste isolation.** Morgan, W.C. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jun 1981. Contract AC06-76RL01830. 42p. NTIS, PC A03/MF A01. Order Number DE81026322.

At low temperatures, graphites are chemically inert to all but the strongest oxidizing agents. The raw materials from which artificial graphites are produced are plentiful and inexpensive. Moreover, the physical properties of artificial graphites can be varied over a very wide range by the choice of raw materials and manufacturing processes. Manufacturing processes are reviewed herein, with primary emphasis on those processes which might be used to produce a graphite matrix for the waste forms. The approach, recommended herein, involves the low-temperature compaction of a finely ground powder produced from graphitized petroleum coke. The resultant compacts should have fairly good strength, low permeability to both liquids and gases, and anisotropic physical properties. In particular, the anisotropy of the thermal expansion coefficients and the thermal conductivity should be advantageous for this application. With two possible exceptions, the graphite matrix appears to be superior to the metal alloy matrices which have been recommended in prior studies. The two possible exceptions are the requirements on strength and permeability; both requirements will be strongly influenced by the containment design, including the

choice of materials and the waste form, of the multibarrier package. Various methods for increasing the strength, and for decreasing the permeability of the matrix, are reviewed and discussed in the sections in Incorporation of Other Materials and Elimination of Porosity. However, it would be premature to recommend a particular process until the overall multi-barrier design is better defined. It is recommended that increased emphasis be placed on further development of the low-temperature compacted graphite matrix concept.

26908 **(RHO-SA—217) Radionuclide reactions with groundwater and basalts from Columbia River basalt formations.** Barney, G.S. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Jun 1981. Contract AC06-77RL01030. 47p. (CONF-8106119—1). NTIS, PC A03/MF A01. Order Number DE81025506.

From Northwest regional American Chemical Society meeting; Bozeman, MT, USA (17 Jun 1981).

Chemical reactions of radionuclides with geologic materials found in Columbia River basalt formations were studied. The objective was to determine the ability of these formations to retard radionuclide migration from a radioactive waste repository located in deep basalt. Reactions that can influence migration are precipitation, ion-exchange, complexation, and oxidation-reduction. These reactions were studied by measuring the effects of groundwater composition and redox potential (Eh) on radionuclide sorption on fresh basalt surfaces, a naturally altered basalt, and a sample of secondary minerals associated with a Columbia River basalt flow. In addition, radionuclide sorption isotherms were measured for these materials and reaction kinetics were determined. The radionuclides studied were ^{137}Cs, ^{85}Sr, ^{75}Se, /sup 95m/Tc, ^{237}Np, ^{241}Am, ^{226}Ra and ^{237}Pu. The Freundlich equation accurately describes the isotherms when precipitation of radionuclides does not occur. In general, sorption increased in the order: basalt < altered basalt < secondary minerals. This increase in sorption corresponds to increasing surface area and cation exchange capacity. The Eh of the system had a large effect on technetium, plutonium, and neptunium sorption. Technetium(VII), Pu(VI), and Np(V) are reduced to Tc(IV), Pu(IV), and Np(IV), respectively, under Eh conditions expected in deep basalt formations. The kinetics of radionuclide sorption and basalt-groundwater reactions were observed over a period of 18 weeks. Most sorption reactions stabilized after about four weeks. Groundwater composition changed the least in contact with altered basalt. Contact with secondary minerals greatly increased Ca, K, and Mg concentrations in the groundwater.

26909 **(SAND—80-1120) Analytical and numerical analyses of hydrologic well-bore experiments.** Eaton, R.R.; Hayes, D.B. (Sandia National Labs., Albuquerque, NM (USA)). Jun 1981. Contract AC04-76DP00789. 41p. NTIS, PC A03/MF A01. Order Number DE81025893.

An analytical approximate method and a finite-difference numerical model (based on the rate at which a borehole fills with water) were developed to estimate permeability of the Magenta Formation in southeastern New Mexico near the proposed Waste Isolation Pilot Project (WIPP) site. The analytical treatment applies to certain simple geometries with idealized boundary conditions (constant properties, ground water compressibility negligible). Permissible geometries include water-collecting cylinders with large needle-like aspect ratios located beneath the water table. The analytical treatment clearly shows the sensitivity of inferences and conclusions to material properties and geometries. Much of the existing well-bore fill-rate data fall within the range of validity of this simplified analysis. Admission of compressibility effects into the generalized Darcy law, and a nondimensionalization of the equations identify the range of experimental conditions and material properties for which the approximations are invalid. In the numerical capability to complement this analytical treatment, numerous restrictions have been removed so that the code can treat complex geometries for a variety of boundary conditions and variable properties. The compressibility term that is excluded in the analytical treatment is maintained in these numerical solutions. The resulting equations are formally parabolicand can be solved by an implicit integrator with guaranteed stability. The two methods, applied to several different experimental situations, agree with each other. 9 figures, 3 tables.

26910 **(SAND—80-2577/Vol.2) Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 1 of 2.** Talbert, D.M. (ed.). (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 850p. NTIS, PC A99/MF A01. Order Number DE81023764.

Volume II of the sixth annual report describing the progress and evaluating the status of the Subseabed Disposal Program contains the appendices referred to in Volume I, Summary and Status. Because of the length of Volume II, it has been split into two parts for publication purposes. Part 1 contains Appendices A-O; Part 2 contains Appendices P-FF. Separate abstracts have been prepared of each Appendix for inclusion in the Energy Data Base.

26911 (SAND—80-2577/Vol.2, pp 9-21) **Analysis of diffusion ion transport in ocean sediments: subseafloor disposal of radioactive waste.** Nuttall, H.E.; Ray, A.K.; Davis, E.J. (Univ. of New Mexico, Albuquerque). Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 1 of 2.

Diffusion-controlled transport of radioactive ions through seabed sediments is analyzed to determine the rates of transport between a buried canister releasing radioactive waste and the ocean floor. The general solution of the unsteady-state diffusion problem is obtained for an arbitrary release rate from the canister, and analytical solutions are obtained for two special cases: 1. instantaneous release of the ionic species; and 2. a constant discharge rate. The former case for a material with an infinite half-life represents the worst case condition. The analytical expressions for the ion concentration distributions, ionic flux to the ocean floor, total release rate to the ocean floor, and bio-loading show that the sediment thickness, canister depth, effective diffusivity, and ion half-life affect the transport rates, but the rates are insensitive to sediment porosity and bulk density over the narrow ranges in which they might be expected to vary.

26912 (SAND—80-2577/Vol.2, pp 23-64) **Scenarios for sub-seabed disposal of high level radioactive wastes.** Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 1 of 2.

Four (4) Scenarios describe the disposal of high level radioactive wastes from commercial LWRs in ocean seabed sediments. Two (2) of these Scenarios describe the disposal of spent reactor fuel assemblies in the Pacific and/or Atlantic Ocean sub-seabeds. The other two (2) Scenarios describe the disposal of solidified high level liquid wastes from fuel reprocessing plants. Three (3) Reports describe the various transportation modes and mode-mixtures; estimate the security and monitoring requirements for the Scenarios; and identify the items and systems that generate costs.

26913 (SAND—80-2577/Vol.2, pp 67-137) **Subseabed disposal risk assessment: review and program plan.** Koplik, C.M. (Analytic Sciences Corp., Reading, MA). Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 1 of 2.

This report provides a basis for the performance of risk assessment studies for seabed disposal of nuclear wastes. The risk analysis is divided into two phases: pre-disposal which includes all transport, handling and emplacement activities and long-term (post-disposal) which addresses the potential hazard after waste is safely emplaced. A preliminary definition of information requirements for both the pre-disposal and long-term risk analysis is presented. Available information that might be relevant to seabed risk assessment is reviewed with special emphasis on the continental waste disposal programs. Based on these scoping studies a work plan is developed for future detailed risk assessment analysis.

26914 (SAND—80-2577/Vol.2, pp 301-322) **Radionuclide sorption and diffusion studies.** Erickson, K.L. (Sandia National Labs., Albuquerque, NM). Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 1 of 2.

During the current reporting period, priority of effort has been given to continuing the analysis of sorption mechanisms at ambient pressure and 4°C and to the initiation and analysis of data from one-dimensional diffusion experiments conducted using selected radionuclides. This report summarizes final sorption equilibrium data obtained when 0.68 n NaCl solutions containing either technetium, uranium, plutonium, americium, or curium were contacted with samples of red clay. Some initial results from experiments designed to determine the relative selectivity of the clay for various nuclides are also summarized, and the status of the one-dimensional diffusion experiments is discussed. Under mildly oxidizing conditions, the sorption equilibrium distribution coefficients for technetium were essentially zero. At solution-phase nuclide concentrations on the order of 10^{-6} M and less and at solution pH values of about 6.9, the distribution coefficients for plutonium were about 3×10^3 ml/gm and for uranium, americium, and curium were about 10^5 ml/gm or greater. However, at solution pH values of about 2.7, the distribution coefficients for each of the nuclides were greatly diminished. Initial experiments conducted in order to determine the relative selectivity of the clay for cesium, barium, cerium, and americium indicated that the silicate phases in the clay were selective for cesium over barium and cerium. These experiments also indicated that the hydrous oxide phases were selective for cerium over barium and for barium over cesium. Initial one-dimensional diffusion experiments have been conducted using ^{22}Na, ^{137}Cs, ^{133}Ba, ^{144}Ce, and ^{152}Eu. Much of the diffusion data which have been obtained appear to be consistent with results which would be predicted using the diffusion equation and experimentally obtained sorption equilibrium data.

26915 (SAND—80-2577/Vol.2, pp 349-364) **Thermal and fluid analyses.** Hickox, C.E. Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January to December 1979. Volume II. Appendices (principal investigator progress reports). Part 1 of 2.

Summaries are presented of progress made in the sub-seabed disposal program. Reports in the following areas are presented: steady thermal convection; radionuclide transport; thermal and fluid analysis support for ISHTE; scale study of the in-situ heat transfer experiment; computer program MARIAH; convection in ocean sediments, validity of the Boussinesq approximation, calculation of induced pressure with SHAFT 79; thermal properties of sediment; thermal transport near the critical point; thermal convection induced by concentrated sources; laboratory flow in porous media; and effect of burrows on thermal transport.

26916 (SAND—80-2577/Vol.2, pp 495-533) **Development of an in-situ heat transfer experiment (ISHTE) for illite clays of MPG-1.** Olson, L.O.; Ewart, T.E. (Univ. of Washington, Seattle). Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January to December 1979. Volume II. Appendices (principal investigator progress reports). Part 1 of 2.

During 1979 the Applied Physics Laboratory of the University of Washington has been working on the design and development of components for an In-Situ Heat Transfer Experiment (ISHTE). The goal of the experiment is to test the validity of using laboratory experiments and analytical studies to predict the thermal response of red clay sediments in the deep ocean. All areas of the conceptual ISHTE developed during 1978 have been investigated this year at some level, with the greatest emphasis on the key components. Because the platform tracking and acoustic communication system is the most crucial component of the experiment, the major effort has been spent on developing this equipment. Hardware and software for the system are nearly operational. Some preliminary testing to evaluate transducers has been performed in Puget Sound and at shallow ocean depths. The transducers purchased initially were not adequate, but units from another company have been purchased and tested with good results. Deep ocean transponder tests will be run in the spring of 1980, and tests of the full tracking system will be conducted in July of 1980 at MPG-1. Several other hardware systems developed this year were an electric heater to simulate the isotope heatsource for system testing, the heater implantment arm, the heater's thermal sensor system, the thermal sensors for the sediment, and a 1/5 scale model of the planned ISHTE platform for visulization of component interaction. The hydrostatic corers are being designed but no construction will be started on prototypes until late 1980. No severe problems have been found thus far with the conceptualized system for the ISHTE platform, and work is progressing on building and testing all of these component systems before the seafloor platform is designed in detail. Present plans are to start designing the platform in FY 81.

26917 (SAND—80-2577/Vol.2, pp 535-744) **Geotechnical aspects of subseabed disposal of high level radioactive wastes.** Silva, A.J.; Calnan, D.I. (Univ. of Rhode Island, Kingston). Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 1 of 2.

Additional data on geotechnical properties of MPG-1 sediments are presented. New data on Distal Abyssal Plain sediments east of the North Bermuda Rise (MPG-3N) indicates that this region has characteristics which compare favorably with MPG-1. The new permeability results are consistent with previous reported results for MPG-1 with a coefficient of permeability of approximately 10^{-7} cm/sec. Preliminary results from MPG-3N indicate permeabilities comparable with those of MPG-1. Results are presented for thirty-seven triaxial compression tests on both undisturbed and remolded illite and smectite clays from the North Central Pacific (MPG-1). A preliminary set of repeated loading triaxial compression tests were performed on illite and smectite remolded clays from MPD-1. A device for anisotropic consolidation and triaxial compression has been developed which will allow the study of stress-strain behavior after anisotropic consolidation with zero lateral deformation. The long-term stress-strain behavior of deep sea sediments is the focus of a two-part testing program: Phase 1; room temperature studies, will be completed in Spring, 1980 and Phase 2; temperature effect studies, is now in the equipment development stage and should be underway by June, 1980. The testing portion of the laboratory Hole Closure study has been completed and most of the results are reported. A final technical report will be completed in June, 1980. The involvement of URI/MGL in this project covers five areas: site characterization, geotechnical analysis for platform foundation configuration, laboratory analysis of sediment-structure interaction development of in-situ vane shear apparatus and post-test analysis of recovered data relating to geotechnical behavior.

26918 (SAND—80-2577/Vol.2, pp 745-805) **Mechanical response creep behavior.** Dawson, P.R.; Chavez, D.F. Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 1 of 2.

The primary effort over the past year was directed toward the development of capabilities to analyze the creep of heated, saturated marine sediments. Single constituent models have been used in conjunction with the creeping viscous flow code, COUPLEFLO. These analyses are for limiting cases of sediment mechanical response (applications in which the deformations are slow relative to the time required for excess pore pressures to dissipate). Additional capabilities were added to COUPLEFLO to allow more general problems to be addressed. The first phase of the two constituent model, described in the 1978 annual report, was implemented in a new finite element code NEPTUNE. Verification problems involving interaction of the porous skeleton and pore fluid were analyzed to verify the ability of NEPTUNE to simulate the mechanical response of saturated media.

26919 (SAND—80-2577/Vol.2, pp 807-823) **Physical simulations using centrifuge techniques.** Sutherland, H.J. (Sandia National Labs., Albuquerque, NM). Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 1 of 2.

Centrifuge techniques offer a technique for doing physical simulations of the long-term mechanical response of deep ocean sediment to the emplacement of waste canisters and to the tempera-

ture gradients generated by them. Preliminary investigations of the scaling laws for pertinent phenomena indicate that the time scaling will be consistent among them and equal to the scaling factor squared. This result implies that this technique will permit accelerated-life-testing of proposed configurations; i.e, long-term studies may be done in relatively short times. Presently, existing centrifuges are being modified to permit scale model testing. This testing will start next year.

26920 (SAND—80-2577/Vol.2, pp 825-848) **Three-dimensional triaxial testing of marine sediments.** Nelson, J.D.; Thompson, E.G. (Colorado State Univ., Fort Collins). Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 1 of 2.

The purpose of this investigation has been to develop testing methods and upgrade equipment for the determination of shear strength of and constitutive relationships for ocean bottom sediments under true three dimensional triaxial states of stress. The research to date has utilized existing 3-D triaxial equipment capable of controlling the three principal stresses independently of each other. Experiments are currently concerned with up-grading the equipment for use with ocean bottom cohesive soils. In addition, stage triaxial tests using conventional laboratory test equipment are being performed.

26921 **(SAND—81-7110) Examinations of samples of Bell Canyon Test 1-FF grout.** Rhoderick, J.E.; Wong, G.S.; Buck, A.D. (Army Engineer Waterways Experiment Station, Vicksburg, MS (USA). Structures Lab.). May 1981. Contract AI97-81ET46633. 20p. (ONWI—246). NTIS, PC A02/MF A01. Order Number DE81025565.

Portland cement grout identified as BCT-1-FF (Bell Canyon Test 1-FF) was used in borehole plugging experiments of the Bell Canyon Tests in Holl AEC-7 at the Waste Isolation Pilot Plant site in New Mexico during September 1979 and February 1980. This grout was made with fresh water. A study of this grout was begun in August 1979 in the laboratory to evauate the possible effects of temperature, pressure, and storage in fresh water or simulated groundwater (brine) on its phase composition and compressive strength at early ages. Phase composition was determined by X-ray diffraction. Temperatures ranged up to about 150°F and included elevation at a few hours age after mixing; pressure was as high as 1500 psi; specimens were stored in simulated groundwater (brine) or in fresh water. Data from 1 to 90 days showed: (a) Higher temperature accelerated early strength gain. These differences essentially vanished by 90 days age. (b) Hydration products as identified by X-ray diffraction were normal; this indicated that a temperature range of 78 to 153°F was not significant. (c) Pressure did not affect composition. (d) Storage in simulated groundwater (brine) or fresh water had no detectable effect. (e) Since the BCT-1-FF grout mixture contained added sulfate, it formed more ettringite as judged by X-ray diffraction than comparable portland cement mixtures without added sulfate.

26922 **(UCRL—84163(Rev.1)) Nuclear waste repository characterization: a spatial estimation/identification approach.** Candy, J.V.; Mao, N. (Lawrence Livermore National Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 8p. (CONF-810815—1(Rev.1)). NTIS, PC A02/MF A01.

From 8. triennial world congress--international federation of automatic control; Kyoto, Japan (24 Aug 1981).

This paper considers the application of spatial estimation techniques to a groundwater aquifer and geological borehole data. It investigates the adequacy of these techniques to reliably develop contour maps from various data sets. The practice of spatial estimation is discussed and the estimator is then applied to a groundwater aquifer system and a deep geological formation. It is shown that the various statistical models must first be identified from the data and evaluated before reasonable results can be expected.

26923 **(UCRL—85191) Thermal properties of rock salt and quartz monzonite to 573°K and 50-MPa confining pressure.** Durham, W.B.; Abey, A.E. (Lawrence Livermore National Lab., CA (USA)). 18 Mar 1981. Contract W-7405-ENG-48. 8p. (CONF-810804—5). NTIS, PC A02/MF A01.

From National heat transer conference; Milwaukee, WI, USA (2 Aug 1981).

Measurements of thermal conductivity, thermal diffusivity, and thermal linear expansion have been made on two rock types, a rock salt and a quartz monzonite, at temperatures from 300 to 573°K and confining pressures from 10 to 50 MPa. The samples were taken from deep rock formations under consideration as possible sites for a nuclear waste repository - the rock salt from a domal salt formation at Avery Island, Louisiana, and the quartz monzonite from the Climax Stock, Nevada Test Site, Nevada. The testing temperature and pressures are meant to bracket conditions expected in the repository. In both rock types, the thermal properties show a strong dependence upon temperature and a weak or non-dependence upon confining pressure. Thermal conductivity and diffusivity both decrease with increasing temperature in approximately linear fashion for samples which have not been previously heated. At 50 MPa in both rocks this decrease closely matches the measured or expected intrinsic (crack-free) behavior of the material. Preliminary indications from the quartz monzonite suggest that conductivity and diffusivity at low pressure and temperature may decrease as a result of heat treatment above 400°K.

26924 **Status of technologies related to the isolation of radioactive wastes in geologic repositories.** Irish, E.R.; Cooley, C.R. (Battelle Pacific Northwest Labs, Wash/DOE). *Radioactive Waste Management (Oak Ridge, Tennessee)* ; **1**: No. 2, 121-146(Sep 1980).

The status of scientific and technical knowledge relevant to the isolation of radioactive wastes in mined geologic respositories is summarized according to: the availability of technologies, the importance of the systems viewpoint in analysis, the importance of modeling, the need for site-specific investigations, the consideration of future subsurface human activities, and the prospects for successful isolation. Successful isolation of radioactive wastes from the biosphere appears technically feasible for periods of thousands of years, provided that the systems view is used in repository siting and design.

0530 Environmental Aspects

REFER ALSO TO CITATION(S) 26898, 26903, 26908, 26913, 27642, 27657

26925 **(PNL—3614) Solubility effects in waste-glass/demineralized-water systems.** Fullam, H.T. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jun 1981. Contract AC06-76RL01830. 66p. NTIS, PC A04/MF A01. Order Number DE81026562.

Aqueous systems involving demineralized water and four glass compositions (including standins for actinides and fission products) at temperatures of up to 150°C were studied. Two methods were used to measure the solubility of glass components in demineralized water. One method involved approaching equilibrium from subsaturation, while the second method involved approaching equilibrium from supersaturation. The aqueous solutions were analyzed by induction-coupled plasma spectrometry (ICP). Uranium was determined using a Scintrex U-A3 uranium analyzer and zinc and cesium were determined by atomic absorption. The system that results when a waste glass is contacted with demineralized water is a complex one. The two methods used to determine the solubility limits gave very different results, with the supersaturation method yielding much higher solution concentrations than the subsaturation method for most of the elements present in the waste glasses. The results show that it is impossible to assign solubility limits to the various glass components without thoroughly describing the glass-water systems. This includes not only defining the glass type and solution temperature, but also the glass surface area-to-water volume ratio (S/V) of the system and the complete thermal history of the system. 21 figures, 22 tables. (DLC)

26926 **(USGS-OFR—81-339) Water-level data: for wells in and near burial ground 4, Oak Ridge National Laboratory, Tennessee, 1975-1979.** Webster, D.A.; Beatty, J.S.; Benjamin, P.M.; Tranum, W.M. (Geological Survey, Knoxville, TN (USA)). 1981. Contract W-7405-ENG-26. 69p. NTIS, PC A04/MF A01. Order Number DE81026215.

This report pressents data pertaning to wells in the general vicinity of Burial Ground 4 at Oak Ridge National Laboratory, Tennessee, for the period 1975 to 1979. It includes an inventory of wells, measurements of water levels, well hydrographs, and a map showing the location of the wells.

0540 Health And Safety

REFER ALSO TO CITATION(S) 26896, 27658, 27759, 27812

26927 (CONF-810678—1) Some statistical aspects of characterizing the distribution of radionuclides in the environment. Hutchinson, S.W.; Miller, F.L. Jr. (Nevada Univ., Las Vegas (USA). Desert Research Inst.). May 1981. Contract AC08-76DP01253; AC08-81NV10162. 16p. NTIS, PC A02/MF A01.

From IMS/WNAR conference; Victoria, BC, Canada (15 Jun 1981).

A radiological characterization was performed at the former Kellex site, the first pilot uranium-diffusion plant, in Jersey City, New Jersey to determine if there were any contaminated regions containing 40 pCi/g or more of ^{238}U in the top 20 cm of soil over a 400 m^2 area. As a result of this radiological survey, final decisions would be made about the need for remedial action (cleanup) and the suitability for unrestricted use of the site. This paper describes the development and the statistical reasoning behind a sampling plan for the radiological characterization.

0550 Regulations

REFER ALSO TO CITATION(S) 26895, 27440, 27618

26928 (DOE/NE—0015) Low-level radioactive waste policy act report. Response to Public Law 96-573. (USDOE Assistant Secretary for Defense Programs, Washington, DC; USDOE Assistant Secretary for Nuclear Energy, Washington, DC). 1980. 63p. NTIS, PC A04/MF A01. Order Number DE81027680.

This report complements the efforts of the Department of Energy to assist the States individually and severally in dealing with their responsibilities for low-level wastes. The information it presents is briefly summarized. Projections of commercial low-level-waste volumes requiring disposal through the year 2000 show that additional disposal capacity will be needed. Within 10 years, the disposal of low-level commercial wastes may require five to seven regional sites, including the three currently in operation. Commercial sites for the disposal of low-level radioactive wastes by shallow land burial have been operating since 1962. The technology for the safe disposal of low-level wastes by shallow land burial is available.

26929 (LA-UR—81-1729) Unique computer system for safeguards use. Kuckertz, T.H.; Pratt, J.C. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 9p. (CONF-810623—6). NTIS, PC A02/MF A01. Order Number DE81025407.

From 24. midwest symposium on circuits and systems; Albuquerque, NM, USA (29 Jun 1981).

Microprocessors have been used to implement specialized scientific data processing systems since 1976. One such system, the LeCroy 3500, is presently being used by the Detection and Verification Group of the Energy Division at Los Alamos National Laboratory for a large variety of tasks involving measurement of various nuclear parameters associated with radioactive materials. The system is unique because it can do not only sophisticated pulse height and multi-scale analyses but also other analyses that are limited only by the availability fo CAMAC modules that would acquire data from exotic experiments. The system is also field portable which extends the range of experiments that it can control. Four applications of this system are described in this paper: (1) plutonium storage vault monitoring, (2) coded aperture image reconstruction, (3) spatial distribution of gamma radiation, and (4) nuclear waste management. 7 figures.

26930 (LA-UR—81-1950) Comparison of materials accounting in conversion and coconversion processes. Dayem, H.A. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 8p. (CONF-810706—12). NTIS, PC A02/MF A01. Order Number DE81025359.

From Institute of Nuclear Materials Management conference; San Francisco, CA, USA (13 Jul 1981).

Materials accounting systems performances are compared for plutonium nitrate-to-oxide conversion [Oxalate (III)] and uranium-plutonium coconversion (Coprecal and modified Coprecal). These processes have the same design basis plutonium throughput and achieve this throughput in parallel operating lines. However, the process line configurations differ. In comparing the materials loss detection sensitivities for the three processes, we find better materials loss detection sensitivity for the Oxalate (III) process than for either of the two Coprecal processes, better single-balance detection sensitivity for the original Coprecal than for the modified Coprecal, and better long-term detection sensitivity (> 1d) for the modified Coprecal than for the original Coprecal. Sensivity differences result from differences in in-process inventories, feeding arrangements, and scrap generation.

26931 (LA-UR—81-1961) Decision-directed materials-accounting procedures: an overview. Shipley, J.P. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 8p. (CONF-810706—13). NTIS, PC A02/MF A01. Order Number DE81025360.

From Institute of Nuclear Materials Management conference; San Francisco, CA, USA (13 Jul 1981).

With materials balances taken at intervals, methods for treating materials balance data and their use by safeguards decision-making are relatively straightforward. The emphasis on accounting in which balances may be drawn on a daily or weekly basis, raises anew questions in these two areas: (1) what is the most effective means of extracting the maximum amount of information; and (2) how should safeguards decision-makers use the results, and what impact does the decision process have on the analysis techniques. These questions lead to considering combinations of materials balances, which exposes a whole new set of concerns. For example, we must select the most appropriate combinations, which implies some consideration of possible diversion scenarios, such as abrupt or protracted. Control of the overall false-alarm rate is an important requisite of the composite procedure. Significant work has been done on loss estimators, but their role in the materials accounting decision process has only begun to be examined. Current criteria may require periodic statements with respect to materials loss; the analysis procedures must be structured to provide such information. This paper presents an overview of the current technology. Questions still to be answered are pointed out.

26932 (LA-UR—81-1964) Sequential tests for near-real-time accounting. Cobb, D.D. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 10p. (CONF-810706—16). NTIS, PC A02/MF A01. Order Number DE81025362.

From Institute of Nuclear Materials Management conference; San Francisco, CA, USA (13 Jul 1981).

Statistical hypothesis testing is used in the analysis of nuclear materials accounting data for evidence of diversion. Sequential hypothesis testing is particularly well suited for analyzing data that arise sequentially in time from near-real-time accounting systems. The properties of selected sequential tests adapted for this application are described. 10 figures, 12 tables.

26933 (LA-UR—81-2024) Evaluating penetration-monitoring systems. Markin, J.T. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 5p. (CONF-810706—11). NTIS, PC A02/MF A01. Order Number DE81025378.

From Institute of Nuclear Materials Management conference; San Francisco, CA, USA (13 Jul 1981).

Evaluating the performance of a process monitoring system in detecting improper activities that could be related to material diversion requires a framework for addressing the complexity and statistical uncertainty of such systems. This report proposes a methodology that determines the optimal divertor strategy against a monitoring system and the system probability of detection. This

method extends previous work by correctly modeling uncorrelated and correlated measurement errors for radiation monitors.

26934 (MLM—2845-OP) Application of the controllable unit approach (CUA) to a low enrichment uranium fuel facility. Foster, K.W.; Rogers, D.R.; Armstrong, D.B.; Miles, J.C. (Mound Facility, Miamisburg, OH (USA)). 1981. Contract AC04-76DP00053. 7p. (CONF-810706—8). NTIS, PC A02/MF A01. Order Number DE81025136.

From Institute of Nuclear Materials Management conference; San Francisco, CA, USA (13 Jul 1981).

The Controllable Unit Approach (CUA) has been tested in a high-throughput, low-enrichment uranium fuel fabrication facility. Plant-wide operating data were collected over a six-month period, and these data were collated and analyzed to determine the material loss detectability afforded by processgenerated measurements. This test reinforced the concept that process control/quality control (PC/QC) data can be used effectively for material loss detection. Preliminary material balance closures in the conversion and pelleting operations identified two types of errors in addition to measurement errors that contribute to overall variability of the measurement system. These are data errors and phasing errors. 4 figures.

26935 (SAND—81-0517C) Comparative study of adaptive-noise-cancellation algorithms for intrusion detection systems. Claassen, J.P.; Patterson, M.M. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 8p. (CONF-810623—8). NTIS, PC A02/MF A01. Order Number DE81023761.

From 24. midwest symposium on circuits and systems; Albuquerque, NM, USA (29 Jun 1981).

Some intrusion detection systems are susceptible to nonstationary noise resulting in frequent nuisance alarms and poor detection when the noise is present. Adaptive inverse filtering for single channel systems and adaptive noise cancellation for two channel systems have both demonstrated good potential in removing correlated noise components prior detection. For such noise susceptible systems the suitability of a noise reduction algorithm must be established in a trade-off study weighing algorithm complexity against performance. The performance characteristics of several distinct classes of algorithms are established through comparative computer studies using real signals. The relative merits of the different algorithms are discussed in the light of the nature of intruder and noise signals.

26936 (SAND—81-0585C) Generic Physical Protection Logic Trees. Olson, C.E.; Paulus, W.K.; Woellhart, L.E. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 6p. (CONF-810706—15). NTIS, PC A02/MF A01. Order Number DE81025392.

From Institute of Nuclear Materials Management conference; San Francisco, CA, USA (13 Jul 1981).

The problem of evaluating the performance of a physical protection system occurs at several points in the life cycle of such a system. A number of different system evaluation techniques have been developed to address this range of needs. The Generic Physical Protection Logic Trees (GPPLT) evolved out of the need for a performance evaluation technique suited to the conceptual design of improvements in physical protection systems at DOE facilities.

06 FUSION FUELS

0602 Processing

26937 (HEDL-SA—2343-FP) Lithium purity and characterization. Meadows, G.E.; Keough, R.F. (Hanford Engineering Development Lab., Richland, WA (USA)). Feb 1981. Contract AC14-76FF02170. 17p. (CONF-810402—11). NTIS, PC A02/MF A01. Order Number DE81024106.

From Corrosion/81 annual meeting; Toronto, Canada (6 Apr 1981).

The accurate measurement of impurities in lithium is basic to the study of lithium compatibility with fusion reactor materials. In the last year the Hanford Engineering Development Laboratory (HEDL) has had the opportunity to develop sampling and analytical techniques and to apply them in support of the Experimental Lithium System (ELS) as a part of the Fusion Materials Irradiation Test Project. In this paper we present the analytical results from the fill, start-up and operation of the ELS. In addition, the analysis and purification of navy surplus ingot lithium which is being considered for use in a larger system will be discussed. Finally, the analytical techniques used in our laboratory will be summarized and the results of a recent round robin lithium analysis will be presented.

0603 By-products

26938 (BNL—29312) Thermal and structural design aspects of high-temperature blankets for fusion synfuel production. Powell, J.R.; Fillo, J.A.; Reich, M. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 10p. (CONF-810801—43). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

The most promising process, high temperature electrolysis (HTE) of steam at temperatures of $\cong$ 1000°C is examined. In HTE, a large fraction (up to $\sim$ 50%) of the energy input to split water to hydrogen and oxygen comes from thermal energy. For the projected operating conditions achieved by high temperature fusion blankets, overall efficiencies for hydrogen production should be on the order of 60%. The design, thermal-hydraulics, and materials for such blankets are discussed.

26939 (BNL—29581) HYFIRE II: a fusion/synfuel producer. Fillo, J.A. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 4p. (CONF-810812—21). NTIS, PC A02/MF A01. Order Number DE81023702.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

HYFIRE II is a point design study of a commercial fusion Tokamak reactor coupled to a high-temperature electrolysis (HTE) system for the production of hydrogen and oxygen. The purpose of the study is to assess the technical and economic feasibility of the application of fusion energy for the production of these basic fuels. The HYFIRE II fusion reactor design is based on the STARFIRE commercial power reactor, the primary differences are in the type of blankets between the two reactors, the power cycle design and in the increased thermal power rating (to 6000 MW(th)). Otherwise, the major features of STARFIRE which are maintained include: steady-state operation; rf drive; mechanical limiters; number of TF coils; etc. Based on HYFIRE conceptual design studies to date, the following observations are made: a) blanket designs have been identified to simultaneously meet global tritium breeding requirements and required energy splits between process steam and helium; b) attractive tritium breeders such as $LiAlO_2$ and liquid lead with dissolved lithium have been identified; c) gross power cycle efficiencies in the 40 to 45% range appear achievable; and d) high H_2 production efficiencies in the 50 to 55% range appear achievable.

26940 (UCRL—85287) Configuring the thermochemical hydrogen sulfuric acid process step for the Tandem Mirror Reactor. Galloway, T.R. (Lawrence Livermore National Lab., CA (USA)). 1 May 1981. Contract W-7405-ENG-48. 8p. (CONF-810812—24). NTIS, PC A02/MF A01. Order Number DE81024711.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

This paper identifies the sulfuric acid step as the critical part of the thermochemical cycle in dictating the thermal demands and temperature requirements of the heat source. The General Atomic Sulfur-Iodine Cycle is coupled to a Tandem Mirror. The sulfuric acid decomposition process step is focused on specifically since this step can use the high efficiency electrical power of the direct converter together with the other thermal-produced electricity to Joule-heat a non-catalytic SO_3 decomposer to approximately 1250°K. This approach uses concepts originally suggested by Dick Werner and Oscar Krikorian. The blanket temperature can be lowered to about 900°K, greatly alleviating materials problems, the level of technology required, safety problems, and costs. A moder-

ate degree of heat has been integrated to keep the cycle efficiency around 48%, but the number of heat exchangers has been limited in order to keep hydrogen production costs within reasonable bounds.

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

0703 Isotopic Power Supplies

REFER ALSO TO CITATION(S) 27424

26941 (ORNL—5775) Preparation and characterization of cesium-137 aluminosilicate pellets for radioactive source applications. Schultz, F.J.; Tompkins, J.A.; Haff, K.W.; Case, F.N. (Oak Ridge National Lab., TN (USA)). Jul 1981. Contract W-7405-ENG-26. 92p. NTIS, PC A05/MF A01. Order Number DE81025777.

Twenty-seven fully loaded ^{137}Cs aluminosilicate pellets were fabricated in a hot cell by the vacuum hot pressing of a cesium carbonate/montmorillonite clay mixture at 1500°C and 570 psig. Four pellets were selected for characterization studies which included calorimetric measurements, metallography, scanning electron microscope and electron backscattering (SEM-BSE), electron microprobe, x-ray diffraction, and cesium ion leachability measurements. Each test pellet contained 437 to 450 curies of ^{137}Cs as determined by calorimetric measurements. Metallographic examinations revealed a two-phase system: a primary, granular, gray matrix phase containing large and small pores and small pore agglomerations, and a secondary fused phase interspersed throughout the gray matrix. SEM-BSE analyses showed that cesium and silicon were uniformly distributed throughout both phases of the pellet. This indicated that the cesium-silicon-clay reaction went to completion. Aluminum homogeneity was unconfirmed due to the high background noise associated with the inherent radioactivity of the test specimens. X-ray diffraction analyses of both radioactive and nonradioactive aluminosilicate pellets confirmed the crystal lattice structure to be pollucite. Cesium ion quasistatic leachability measurements determined the leach rates of fully loaded ^{137}Cs sectioned pollucite pellets to date to be 4.61 to 34.4 x 10^{-10} kg $m^{-2}s^{-1}$, while static leach tests performed on unsectioned fully loaded pellets showed the leach rates of the cesium ion to date to be 2.25 to 3.41 x 10^{-12} kg $m^{-2}s^{-1}$. The cesium ion diffusion coefficients through the pollucite pellet were calculated using Fick's first and second laws of diffusion. The diffusion coefficients calculated for three tracer level ^{137}Cs aluminosilicate pellets were 1.29 x $10^{-16}m^2s^{-1}$, 6.88 x $10^{-17}m^2s^{-1}$, and 1.35 x $10^{-17}m^2s^{-1}$, respectively.

26942 (TES—33009-33) Selenide isotope generator for the Galileo Mission: safety test plan. (Teledyne Energy Systems, Timonium, MD (USA)). 31 Jan 1979. Contract AC03-78ET33009. 28p. NTIS, PC A03/MF A01.

The intent of this safety test plan is to outline particular kinds of safety tests designed to produce information which would be useful in the safety analysis process. The program deals primarily with the response of the RTG to accident environments; accordingly two criteria were established: (1) safety tests should be performed for environments which are the most critical in terms of risk contribution; and (2) tests should be formulated to determine failure conditions for critical heat source components rather than observe heat source response in reference accident environments. To satisfy criterion 1. results of a recent safety study were used to rank various accidents in terms of expected source terms. Six kinds of tests were then proposed which would provide information meeting the second criterion.

08 HYDROGEN

0801 Production

REFER ALSO TO CITATION(S) 26742, 26939, 26940, 26965, 27006, 27189, 27456, 27484, 27512, 27535

26943 (CONF-801055—, pp 142-144) Status report on the International Energy Agency's (IEA) hydrogen production program. Swisher, J.H. (Dept. of Energy, Washington, DC). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

A status report on each of the six annexes to the original agreement is given. The annexes are: thermochemical hydrogen production; heat source interface technology; assessment of potential future markets; advanced alkaline and solid polymer water electrolysis; solid oxide water vapor electrolysis; and photocatalytic water electrolysis.

26944 (CONF-801055—, pp 145-149) Chemical/hydrogen energy storage systems. Miller, D.S.; Mezzina, A. Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The hydrogen energy R and D projects sponsored by the Division of Energy Storage (STOR) in FY 1979 were transferred to the Brookhaven Area Office (BHO) in FY 1980 in response to the Department of Energy's (DOE) program decentralization objectives. Subsequently, the Office of Advanced Conservation Technologies (AC) was created from STOR. The hydrogen energy research and development (R and D) projects previously sponsored by STOR were reorganized into two basic R and D areas (with related technologies) as part of the decentralization plan. Those two areas are: hydrogen production via thermochemical cycles with related material compatability R and D and the hydrogen production via electrolysis-based systems with related hydrogen storage systems R and D. The Brookhaven National Laboratory (BNL) serves as technical monitor on all projects included in the electrolysis-based R and D subprogram and performs the management tasks associated with these projects. The Jet Propulsion Laboratory (JPL) performs a similar function for all projects included in the thermochemical cycles subprogram. Both BNL and JPL report directly to BHO. This includes technical direction on all projects, financial reporting, milestone compliance, monthly reporting, and the annual operating plan. BHO ensures that Headquarters/AC receives copies of all correspondence submitted and keeps HQ/AC appraised of all important issues. All other contractors and national laboratories will report directly to BHO. The overall program management structure is illustrated, including the roles of AC, BHO, BNL, JPL and The Aerospace Corporation.

26945 (CONF-801055—, pp 170-171) Development status of a metal hydride process for hydrogen recovery. Huston, E.L. (MPD Technology Corp., Wyckoff, NJ). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

A new project seeking to develop and demonstrate a commercial metal hydride process for hydrogen recovery has been initiated by DOE through Brookhaven National Laboratory with Ergenics. The status of hydride separation technology is reviewed and the project milestones are summarized in this report.

26946 (CONF-801055—, pp 172-174) Development status of solid polymer electrolyte water electrolysis for large scale hydrogen generation. Russell, J.H. (General Electric Co., Wilmington, WA). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

During 1980, progress continued on the joint Department of Energy, Electric Utility and General Electric Company - sponsored development of the Solid Polymer Water Electrolysis Technology for large-scale hydrogen generation. Highlighting the program achievements for the year, a hydrogen generator module, capable of producing 2000 SCFH, was operated successfully for over 700 hours in the 200-kW system. Test results and further information are presented. Technology development was continued in support of improving both capital cost and conversion efficiency. Progress made in the development of the 10 ft^2-active-area cell included completion of the initial design, the beginning of fabrication development, and installation of new facilities for cell manufacture.

26947 (CONF-801055—, pp 175-177) **Advanced alkaline water electrolysis.** Murray, J.N. (Teledyne Energy Systems, Timonium, MD). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

This brief report summarizes the results of the two major investigation areas pursued during the last 12 months under the Teledyne Energy Systems (TES) contracts with the Brookhaven National Laboratory. A fourth generation computer program was prepared which determines the economics of manufacturing hydrogen via alkaline water electrolysis. The program was tested by identifying the relative economic merits of the TES-C-AN cathode, the electrolysis module operating temperature range, the optimal module design current density and by comparing the published goals of the advanced alkaline technology to the published SPE goals. The submitted, task final report and analytical procedures are being subjected to a critical independent review. The experimental tasks were focused on verification of the stability of the TES-C-AN cathode structure supplied to TES by the British Petroleum Research Centre, and investigating the improvements possible via new anode structures and new, thinner electrode separators. The data indicate the technology of 1.73 +- 0.02 volt/cell, 500 ma/cm^2 at 100°C (86% voltage efficiency) can be improved to 1.60 volt/cell (92.5% voltage efficiency) with small improvements to the anode and separator components. A module containing the best technology available will be assembled and tested in GFY 1981.

26948 (CONF-801055—, pp 178-181) **Static feed water electrolysis for large scale hydrogen generation.** Schubert, F.H. (Life Systems, Inc., Cleveland, OH). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The static feed water electrolysis concept, originally developed by Life Systems, Inc., for aerospace application is being evaluated for application in large-scale hydrogen generation. The inherent potential for low cost and high performance of this alkaline electrolyte-based technique resulted in the award of a nine-month, Department of Energy funded program to Life Systems, Inc. A four-task program has been negotiated having a start date of August 15, 1980. The proposed effort will address four areas: (1) definition of upper current density levels possible with the static feed concept, (2) investigation of operation with contaminated water (e.g., seawater), (3) scale-up of cell area, and (4) definition of future scale up at the cell stack and system level. This paper presents the static feed concept, its operation and demonstrated performance. Also, the scope of each of the four program tasks is defined. Results relating to the specific program are not presented since the program had not started at time of submittal of this paper.

26949 (CONF-801055—, pp 182-187) **Selection and evaluation of materials for advanced water electrolysis.** Stoner, G.E. (Charlottesville); Moran, P.J. Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

During the past year (7/79-7/80), the majority of research conducted on this contract concerned time dependent increases in electrolysis cell voltage. This phenomenon has been investigated at the Applied Electrochemistry Laboratory at the University of Virginia for the past four years. This report is a conclusive summary of these research activities dating from approximately March of 1976. The majority of this research was conducted during the past two fiscal years.

26950 (CONF-801055—, pp 214-217) **Hydropowered electrolysis in New York State.** Mathusa, P.D.; Wiley, R.A. (New York State Energy Research and Development Authority, Albany). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

An inventory of New York State's hydropower potential conducted by the New York State Energy Research and Development Authority has located more than 1000 sites with dams in the state which could be refurbished to produce power. It is estimated that these facilities can be made to generate 3.8-billion kilowatt hours of (firm) electrical power per annum. The present low rates which the utilities are willing to pay for excess dumped energy have motivated hydropower developers to find more lucrative means of utilizing excess power. Specifically, the Village of Potsdam has found that the use of excess power to operate an advanced technology solid polymer electrolyzer can produce research grade hydrogen whose kilowatt-hour equivalent value is more than 10 times greater than that of dumped electrical energy. To achieve this goal, the Village's hydropower facility will be equipped with two, 350-kilowatt tube turbines and a 200-kilowatt electrolyzer. The latter will produce approximately 18-million standard cubic feet of hydrogen annually which will be sold for $.50 per hundred cubic feet.

26951 (CONF-801055—, pp 232) **Recent work in advanced hydrogen production concepts.** Lawson, D.D. (California Inst. of Tech., Pasadena). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

A technical and programmatic overview of the Advance Hydrogen Production Concept activities during the past year will be presented. The presentations will include a description of the activities and results with comments on the limiting or pacing technology.

26952 (CONF-801055—, pp 233236) **Production of hydrogen by electron transfer catalysis using conventional and photochemical means.** Rillema, D.P. (Jet Propulsion Lab., Pasadena, CA). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

Alternate methods of generating hydrogen from the sulfuric acid thermal or electrochemical cycle are presented. A number of processes requiring chemical, electrochemical or photochemical methods are presented. These include the design of potential photoelectrodes and photocatalytic membranes using $Ru(bpy)_3^{2+}$ bpy = 2,2′-bipyridine, impregnated Nafion tubing and the design of experiments to study the catalyzed electrolytic formation of hydrogen and sulfuric acid from sulfur dioxide and water using quinones as catalysts. Experiments are currently being carried out to determine the value of the new approaches to energy conversion.

26953 (CONF-801055—, pp 240-242) **LASL thermochemical hydrogen program status on September 30, 1980.** Cox, K.E.; Peterson, C.L.; Jones, W.M.; Bowman, M. (Los Alamos Scientific Lab., NM). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The work described here was accomplished during the period October 1, 1979 to September 30, 1980. Highlights of the experimental program were: a solid decomposition facility was constructed and used to study the handling of bismuth oxysulfates and the kinetics of their decomposition. The results of our kiln experiments showed that a substantial amount of bismuth oxysulfate decomposition occurs with residence times under 2 min at temperatures between 973 and 1143 K. The LASL bismuth sulfate subcycle thus appears a candidate for hydrogen production utilizing a solar heat source. In the evaluation phase of our work, the technoeconomics of the hybrid sulfur cycle were determined and compared with several published results as well as compared to the technoeconomics for water electrolysis processes for hydrogen production. We aided the efforts of the Department of Energy (DOE) Thermochemical Cycle Evaluation Panel in reviewing the Lawrence Livermore Laboratory (LLL) zinc selenide cycle as well as the General Atomic (GA) sulfur-iodine cycle.

26954 (CONF-801055—, pp 243-247) **Development status of the sulfur cycle electrolysis technology.** Lu, P.W.T.; Ammon, R.L.; Parker, G.H. Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

Recent advances in electrode fabrication techniques and cell configuration have substantially improved both the cell voltage and the performance stability. While operating in 50 w/o sulfuric acid at 50°C and 1 atm, the measured cell voltage of an SO_2-depolarized

electrolyzer was 736 mV (including ohmic loss) at 200 mA/cm². A one-week endurance test was successfully conducted at 100 mA/cm², and a stabilized cell voltage of 675 mV was achieved after 80 hours of continuous operation. The resulting gas from the test cell contained 98.7 v/o hydrogen. Experimental efforts also included kinetic studies on metal electrodes, measurements of temperature effects on electrode kinetics, investigations of electrocatalytic activities of metal electrodes, cyclic voltametric studies and evaluation of alternate catalysts. The RAI P-4010 membrane has been identified as a promising gas separator. The noble metal loading has been reduced to ~ 2 mg/cm² at the anode and cathode, respectively, with no loss in cell performance.

26955 (CONF-801055—, pp 252-253) **Progress in thermochemical hydrogen production.** England, C. Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

Rapid progress in the technology of thermochemical hydrogen production coupled with rising energy prices brought this technology closer to parity with conventional energy conversion processes in 1979 to 1980. Progress in the major pure thermal cycle (sulfur-iodine) and the major hybrid cycle indicated that cost and efficiency goals set for these cycles could be met with continued process research and development. Rising projections for synfuels costs place fuels from primary heat within range of fuels from fossil energy. Present projections indicate hydrogen may be produced by either major cycle for about $12.00/GJ vs about $9.00 for gasified coal.

26956 **(LA-UR—81-1730) Solar-thermal hydrogen production.** Bowman, M.G. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 9p. (CONF-810137—2). NTIS, PC A02/MF A01. Order Number DE81025406.

From Solar thermal test facility (STTF) workshop: STTF testing for long-term system performance; Albuquerque, NM, USA (7 Jan 1981).

Since hydrogen is not only an eventual and attractive fuel but is also a prime intermediate in the production of many fuels and chemicals, one extremely valuable utilization of a solar thermal facility would be its operation as a system for hydrogen production. Such a use would also fulfill the important requirement for energy storage. Solar thermal systems appear to offer the only practical method for significant hydrogen production from solar energy. The production could utilize advanced methods of water electrolysis if highly efficient generation of solar electricity were developed. Thermochemical cycles for water decomposition appear to be more promising if cycles that match the characteristics of solar heat sources can be developed. Advanced cycles based on solid sulfate or solid oxide decomposition reactions should interface advantageously with solar thermal systems. Sulfuric acid cycles can serve as standards of comparison for these new cycles as they are discovered and developed.

26957 **(LBL—11945) Electrolytic gas evolution in forced flow.** Hui, W.C.; Tobias, C.W. (Lawrence Berkeley Lab., CA (USA); California Univ., Berkeley (USA). Dept. of Chemical Engineering). Dec 1980. Contract W-7405-ENG-48. 98p. NTIS, PC A05/MF A01. Order Number DE81025208.

Thesis.

The effects of forced flow and cathode surface morphology on the nature of hydrogen bubble evolution in 5M KOH solution have been investigated in a flow system; a special flow channel allowed both optical observation and electrical measurement to be carried out simultaneously. Optical observation was made with regular- and high-speed cameras. Both the overpotential and the incremental ohmic drop caused by bubbles were determined over the current density range of 0.4 to 2000 mA/cm² for purposes of engineering analysis. The bubble evolution behavior was found to depend strongly on the surface morphology of the electrode. This behavior is dominated by the density and the distribution of nucleation sites. Both the bubble size and the incremental resistance caused by bubbles increase with increasing current density. The incremental resistance ranges from a few tenths of an ohm to 2.5 Ω depending on the surface morphology. The corresponding incremental ohmic drop changes for several mV to a few hundred mV, depending on the current density. While forced flow reduces the mass transfer resistance appreciably only at low current densities (< 10 mA/cm²), it may decrease the incremental ohmic drop at current densities above 40 mA/cm² by as much as 30 to 55%.

26958 **Homogeneous catalysis of the photoreduction of water by visible light. 2. Mediation by a tris(2,2′-bipyridine)ruthenium(II)-cobalt(II) bipyridine system.** Krishnan, C.V.; Sutin, N. (Brookhaven National Lab., Upton, NY). *Journal of the American Chemical Society ;* **103**: No. 8, 2141-2142(22 Apr 1981).

The approach of researchers at Brookhaven National Laboratory to the homogeneous generation of hydrogen is to convert the luminescent excited state of tris(2,2′-bipyridine)-ruthenium(II) [$^*Ru(bpy)_3^{2+}$] to the more strongly reducing (and longer lived) ion $Ru(bpy)_3^{+}$. The $Ru(bpy)_3^{+}$ reduces a metal complex which reacts with H_3O^+ or H_2O to form an unstable hydride. The hydride in turn decomposes to yield hydrogen. The blue cobalt(I) bipyridine complexes produced by Na(Hg) or electrochemical reduction of cobalt(II) bipyridine complexes are very powerful reducing agents and are not likely to form stable hydrides in solution. Cobalt(I) bipyridine complexes are thus excellent candidates for mediating the homogeneous formation of hydrogen. This expectation has been confirmed: visible-light irradiation of solutions containing $Ru(bpy)_3^{2+}$, ascorbate, Co^{2+}, and bpy or phen derivatives produces hydrogen with a quantum yield of up to 0.13 mol einstein^{-1}. Low yields of H_2 are also produced in the absence of Co^{2+}.

26959 **Acid-base models as conceptual aids to the development of thermochemical cycles for water splitting. 1. Consideration of simple cycles involving oxides.** Robinson, P.R. Contract W-7405-ENG-26. *Inorganic Chemistry ;* **20**: No. 4, 1011-1021(Apr 1981).

Simple thermochemical cycles-those in which only one element besides H, O, and sometimes Cl undergoes oxidation and reduction-can be treated conceptually as a series of acid-base reactions. For workable cycles involving oxides, the Lux-Flood acid-base model is used; the maximum temperature for a workable cycle is 1300 K. Simple oxide cycles are classified according to their chemistries as (A) cycles involving stable high-oxidation-state oxides, (B) cycles involving unstable high-oxidation-state oxides, and (C) cycles involving unstable low-oxidation-state oxides. In type A and type B cycles, bases drive steam oxidation reactions and acids drive reductive thermal decompositions. In type C cycles, bases drive reduction and acids drive oxidation. Salts are formed in all of these cycles; completion of the cycles requires thermochemical splitting of the salts to regenerate the acid and bases. It is postulated that the standard enthalpy of reaction between the strongest acid and the strongest base used in a cycle is a measure of the chemical energy provided to the cycle by acid-base reactions. It is also shown that-in workable cycles-this standard enthalpy value must ie between -210 and -400 kJ/mol of evolved H_2. The acid-base postulates are combined with oxide decomposition temperatures in a scheme that can serve as a guide for the experimental development of new thermochemical cycles.

26960 **Hydrogen production from coal, water and electrons.** Coughlin, R.W.; Farooque, M. (Univ. of Connecticut, Storrs). *Nature (London) ;* **279**: 301-303(24 May 1979).

Coals and other forms of solid carbonaceous fossil fuel are oxidised to oxides of carbon at the anode of an electrochemical cell and hydrogen is produced at the cathode, these gases being produced in relatively pure states. The reaction proceeds at very mild temperatures and at operating electrical potentials significantly lower than the thermodynamic potential of water electrolysis. Although the reaction is readily observable at room temperature, the observed activation energies and the expected decomposition temperatures of the presumed intermediates suggest that much more rapid and steadier oxidation rates might be achieved at higher temperatures in the range 200 to 600°C.

0802 Storage

REFER ALSO TO CITATION(S) 26966, 27189

26961 (BNL—29667) Small-scale uses and costs of hydrogen derived from OTEC ammonia. Strickland, G. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 11p. (CONF-810812—22). NTIS, PC A02/MF A01. Order Number DE81025083.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

A systems study was made to determine the economic prospects for using anhydrous liquid ammonia, made in Ocean Thermal Energy Conversion (OTEC) plantships, as a hydrogen storage and transport medium for small users who want to assess the purchase of hydrogen in amounts of 0.283 to 2.83 million m^3/y (10 to 100 million std ft^3/y), vs the cost of producing hydrogen at their sites. High-purity (99.9+%) hydrogen is obtained from ammonia by catalytic dissociation at high temperature followed by separation of the nitrogen to the extent required. Cost projections made for hydrogen and the nitrogen-hydrogen mixture from OTEC ammonia, using published OTEC ammonia costs, are compared with published projections for hydrogen made via advanced water electrolysis and via the steam reforming of natural gas. The cost of commercial (merchant) liquid hydrogen and OTEC liquid hydrogen, both stored at the end-user's site, are included in the comparison. Recommendations are made for further work on the use of ammonia as a hydrogen transport and storage medium.

26962 (CONF-801055—, pp 167-169) Hydride chemical compressor. Phase I. Turillon, P.P. (Ergenics, Wyckoff, NJ); Lynch, F.E.; Nye, R.A. Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

A proof-of-concept bench-size hydride compressor has been successfully built and tested. In continuous operation this unit delivered 20.3 liters/min (43SCFH) at a pressure of 42.2 atmospheres (650Psia). The efficiency however was lower than anticipated. The operation of this small unit revealed several important factors which influence the overall efficiency of such a hydride hydrogen compressor. The reduced efficiency of the bench scale unit was caused by mechanical design details (such as excessive amount of copper due to the electrical heating system) as well as problems with the hydriding alloy (reduced capacity at elevated temperatures and decrease in plateau pressure after 700 cycles of operation). A pilot-scale unit to be built in Phase 2 of this program will eliminate the undesirable features uncovered during the tests of the proof of concept unit.

26963 (CONF-801055—, pp 197-200) Microcavity storage update, 1980. Teitel, R.J. (Robert J. Teitel Associates, San Diego, CA). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

Last year, two microsphere grades were evaluated for hydrogen storage in automotive applications (3M-D32/4500 and Fillite 200/.7). The 3M grade came the closest to meeting the automotive requirements. The hydrogen weight density attained was 0.053. This year, test procedures were standardized and eight grades were evaluated. Two new grades (Emerson and Cuming HAS and HASY) appear to be superior in strength to the 3M grade studied last year. Both grades were subjected to 5500 psig nitrogen pressure. The Emerson-Cuming Grade HAS had 80 wt. percent survivors and Grade HASY had 92 percent survivors. Tests on the 3M-D-32/4500 grade indicated 56 percent survivors. Crush tests were performed in hydrogen, nitrogen and helium atmospheres. Some grades appeared to be more resistant to crushing in hydrogen and helium than in nitrogen. Judging from the glass composition, the two Emerson Cuming grades may have difficulty in retaining hydrogen at ambient temperatures. The aspect ratio (diameter to wall thickness) of the eight grades of microsphere beds was measured and correlated to the crush test survivor results. These studies indicated that an average microsphere aspect ratio of about 30 is needed to survive a 6000 psi crush. Measured average aspect ratios on survivors of 6000 psig crush were between 31 and 39. A two cu ft bed of a new lot of 3M-D32/4500 was prepared. The new lot of microspheres did not have the same properties as the original lot used in tests last year. The hydrogen storage density attained was .042. The results of fill-dispense tests and the selection of two grades for further study will be available by the end of the fiscal year. Engineering estimations of hydrogen storage costs will also be available.

26964 (CONF-801055—, pp 204-210) Modification and operation of the Hydrogen Homestead hydride vessel energy storage system. Billings, R.E. (Billings Energy Corp., Independence, MO). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

In researching the aspects of hydrogen energy, an important area of study is the safe storage of the hydrogen fuel. The performance characteristics of bulk hydride storage is the subject of current research being performed at the Billings Energy Corporation, under the direction of Brookhaven National Laboratory. A description of the experimental design and operating proceedings is the subject of this report. The description includes hydrogen production, drying, purification and safety system drying, as well as the monitoring of flow, temperature, pressure data and girth measurement.

0803 Transport

REFER ALSO TO CITATION(S) 26961

0804 Marketing And Economics

REFER ALSO TO CITATION(S) 26947, 26961

26965 (CONF-801055—, pp 227-231) Production cost comparisons of hydrogen from fossil and nuclear fuels and water decomposition. Ekman, D.R. (California Inst. of Tech., Pasadena). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

At the present time, hydrogen is produced almost exclusively from petroleum residual oils and natural gas, and used primarily in petroleum refining product upgrading and as a feedstock in chemical processes. However, since these conventional feedstocks can be expected to escalate greatly in price over the next two decades, alternative methods of producing hydrogen must be developed that are less affected by the dwindling of fossil fuel supplies, particularly petroleum and natural gas. As the relative price movements continue, the alternative methods, coal conversion and hydrogen produced from decomposition of water, begin to offer hydrogen, first, at prices that are competitive in feedstock applications and eventually at prices that will make the use of hydrogen on a large scale, as a general purpose fuel, feasible. This study examined the comparative costs entailed in producing hydrogen by major technologies that rely on petroleum, natural gas, coal, thermochemical cycles, and electrolysis. Since the differenct sources of available data and published studies could not be assessed directly due to differences in size and in economic and technical bases, techniques were developed for comparing these processes by formulating the process data and economic assessments on a uniform and consistent basis. These data were then normalized to permit a meaningful comparative analysis of product costs of these processes through the year 2020. These cost projections are shown graphically.

0805 Safety

26966 (CONF-801055—, pp 211-213) Hydrogen microsphere hazard evaluation. Zalosh, R.G.; Bajpai, S.N. (Factory Mutual Research Corp., Norwood, MA). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

Progress on a preliminary hazard evaluation of hollow glass microspheres for hydrogen transport and storage is reported here. Most of the work to date has involved laboratory testing to assess the flammability and explosibility of representative hydrogen-filled

microspheres. The tests included dust cloud explosion tests, flame propagation tests, impact sensitivity tests, spark ignition tests, and autoignition furnace tests. Test results reveal that the microspheres can be ignited and propagate flame either in the quiesscent bulk form or as a suspended cloud. A preliminary comparison with reported flammability data for gaseous hydrogen and iron titanium hydride powder indicates that the auto-ignition temperature of hydrogen-filled microspheres is comparable to that for the other forms of hydrogen, but suspended clouds of microspheres produce lower explosion pressures than hydride dust or hydrogen gas. Safety codes and government regulations pertinent to hydrogen filled microspheres are also reviewed briefly.

0807 By-products

REFER ALSO TO CITATION(S) 26961

0808 Properties

26967 (CONF-801055—, pp 224-226) **Containment materials: status and summary.** Nelson, H.G. (NASA, Moffett Field, CA). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The final summary of the hydrogen containment materials program accomplished under the technical leadership of NASA-Ames Research Center for the DOE is presented. The safe, reliable, and economic containment of hydrogen is essential to the success of virtually any hydrogen energy transport and storage scheme. The potential problems associated with hydrogen containment are great. A brief review of some of these problems is also presented.

09 OTHER SYNTHETIC AND NATURAL FUELS

REFER ALSO TO CITATION(S) 27244

0901 Hydrocarbon Fuels

REFER ALSO TO CITATION(S) 27009, 27010, 27012, 27241

26968 **(SERI/TR—98372-1-T1) Anaerobic fermentation of beef cattle manure and crop residues. Annual report, 1980.** Hashimoto, A.G.; Chen, Y.R.; Varel, V.H.; Robinson, S.A. (Solar Energy Research Inst., Golden, CO (USA)). May 1981. Contract AC02-77CH00178. 91p. NTIS, PC A05/MF A01. Order Number DE81027295.

This report summarizes research on the feasibility of fermenting manure-crop residue mixtures to methane, and on factors affecting the rate and extent of methane production. Experiments were conducted to evaluate effects of temperature, pH, substrate concentration, and alkaline pretreatment on the rate and extent of hydrolysis of manure-straw mixtures. The effects of mixing duration and vacuum fermenters on methane production rates from anaerobically fermented beef cattle wastes were also determined.

26969 **Methane-producing hydrogenolysis of (eta^5-cyclopentadienyl)(triphenylphosphine)dimethyl-cobalt(III). An autocatalytic mechanism involving a binuclear metal dihydride/metal dialkyl reaction as a critical step.** Janowicz, A.H.; Bergman, R.G. (Univ. of California, Berkeley). Contract W-7405-ENG-48. *Journal of the American Chemical Society ;* **103**: No. 9, 2488-2489(6 May 1981).

This paper reports results on the mechanism of the facile methane-forming hydrogenolysis of cyclopentadienyldimethylcobalt derivatives. These complexes were chosen for study because they given methane on hydrogenolysis, and yet it seemed unlikely that this process could be occuring by loss of phosphine followed by oxidative addition of H_2 to give a formally Co(V) intermediate. It was found that even though no metal hydrides are added as reagents in this reaction, the new C-H bonds are still formed by a binuclear M-H/M-R reaction.

0902 Alcohol Fuels

REFER ALSO TO CITATION(S) 26777, 26983, 26984, 27007, 27010, 27072, 27241, 27243, 27245, 27246, 27335, 27342, 27349, 27350, 27351, 27352, 27353

26970 (EPRI-WS—79-238(Vol.1), pp Section 15, 15.1-15.31) **Status of the Mobil Methanol-to-Gasoline Process.** Kam, A.Y.; Gould, R.M.; Sills, R.A.; Zahner, J.C. May 1981. NTIS, PC A18/MF A01.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

The Methanol-to-Gasoline (MTG) Process is based on the ZSM-5 class of Mobil-discovered zeolite catalyst and offers a new and viable route for producing high quality gasoline from alternative energy resources such as coal, natural gas and biomass. These resources can be readily converted into methanol by using commercially available technologies. The MTG Process in turn converts the methanol into high octane gasoline which is directly marketable and totally compatible with petroleum derived gasoline. In addition, the MTG Process scheme is relatively simple and over 90% energy efficient. Since the mid-1970's, Mobil has carried out extensive process development work on this process. Two modes of operation have been investigated - fixed-bed and fluidized-bed. The former is now ready for commercial application and has been selected for a commercial size plant in New Zealand which will produce 13,000 BPD of synthetic gasoline from natural gas. Startup is projected to be in 1984/1985. The latter is undergoing final stages of engineering development. A 100 BPD fluid-bed MTG pilot plant is under construction in Wesseling, W. Germany and will come on stream in mid-1982.

26971 **(ORNL/MIT—330) Economic evaluation of neutral-solvents fermentation product separation.** Strobel, M.K.; Bader, J.B. (Oak Ridge National Lab., TN (USA); Massachusetts Inst. of Tech., Oak Ridge, TN (USA). School of Chemical Engineering Practice). Jul 1981. Contract W-7405-ENG-26. 63p. NTIS, PC A04/MF A01. Order Number DE81027076.

An evaluation of a neutral-solvents fermentation process was made for comparison with ethanol fermentations, concentrating on performing a simplified separation process design and laying the groundwork for future rigorous calculations. A 150 x 10^6 kg/y fermentation-product stream containing 1-butanol, acetone, ethanol, and water was used as the feed to the separation scheme. Equipment costs were substantially less than ethanol-recovery equipment costs for an identical solvents capacity. In preparation for rigorous separation calculations, parameters for the modified UNIQUAC algorithm for estimating liquid activity coefficients were developed. The overall economics of a neutral-solvents plant were compared with ethanol-fermentation-plant design data by determining the selling price to produce a 15% return on investment assuming equal fermentation costs for both processes. The selling price for neutral solvents from corn, at 48 cents/kg ($1.44/gal), was less than both that for ethanol from corn, 63 cents/kg ($1.89/gal), and the present neutral-solvents market price, 74 cents/kg ($2.22/gal). Furthermore, the neutral-solvents-plant thermal efficiency is higher than the ethanol plant efficiency (91% versus 62%). A sensitivity analysis indicated that the selling price is affected most by raw materials costs, by-product credits, and fermentation equipment costs; thus, the current analysis should be complemented by detailed investigations of these costs.

26972 **[Farm scale production of ethanol].** Stutzman, B. pp 8p, Paper 2 of Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

A description of a small-scale alcohol plant on a farm in Milford, Nebraska is presented in this article. The author describes how he got his project funded, his close association with a local college, and the use of the alcohol produced. For the main part, the alcohol is used in the tractors on the farm. The cooking and fermenting process is done in the same vat. The procedure is described, the equipment evaluated, and heat source described. Future plans include the incorporation of solar energy for process heat and the use of the stillage as animal food. (DMC)

26973 **Energy efficient production of anhydrous ethanol.** Ladisch, M.R.; Hong, J.; Voloch, M. (Purdue Univ., Lafayette, IN). pp 7p, Paper 3 of Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

General results from a screening study on adsorption properties of cellulosic and starch materials, including starch (corn and potato), protein, xylan, pure cellulose, corn residue, cornmeal, wheat straw, and bagasse is presented in this short report. Gas Chromatographic elution methods were applied to adsorption studies for this research. Data from these studies were then compared to larger scale batch adsorption experiments for selected adsorbants. Continuous production of anhydrous alcohol using a pilot unit combining distillation and adsorption is also described.

26974 **Applications of molecular sieve technology in ethanol production.** Locatis, W. (Applied Technologies, Inc., Hastings, NE). pp 12p, Paper 4 of Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

The use of molecular sieves for the production of anhydrous ethanol is discussed in this article. The mechanics of the operation are described as well as the regeneration of the saturated sieve. Design criteria include: feed composition, flow direction, liquid velocity, bed height, sieve capacity, and regeneration. (DMC)

26975 **New membrane technologies for biomass conversion.** Gregor, H.P. (Columbia Univ., New York, NY). pp 4p, Paper 5 of Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

The application of new membrane technologies to biomass conversion processes is discussed in this article. The advantages of using these techniques are energy efficiency, simplicity, and cost. Three membrane processes have been tested at the laboratory scale, and pilot plants are now being constructed. These include: ultrafiltration by non-fouling membranes followed by reverse osmosis to concentrate sugar cane juice from 10 to 12% to 20 to 30% for fermentation; ultrafiltration of fermentation beer to remove suspended solids for animal feeds while providing a clear feedstock for distillation; and treatment of stillage to produce a superior grade distillers dried grain and pure water for re-use. The development of a new membrane technique for the separation of alcohol-water mixtures is discussed. A consortium of scientists is being formed to further investigate these and other techniques, i.e., acid hydrolysis, and to arrive at cost estimates. (DMC)

0904 Solid Waste And Wood Fuels

REFER ALSO TO CITATION(S) 27106

13 HYDRO ENERGY

REFER ALSO TO CITATION(S) 27252

1303 Plant Design And Operation

26976 (DOE/BP—38, pp 82-86) **Small-scale hydro: a profile of the technology.** Cassidy, J.J. (Washington State Univ., Pullman). 1980. NTIS, PC A07/MF A01.

From 2. annual Pacific Northwest alternative and renewable energy resources conference; Portland, OR, USA (27 Oct 1980).

The types of turbines and generators used for low- and medium- head small-scale power plants are reviewed with information on their operating characteristics and a list of manufacturers. (LCL)

1305 Economics And Management

REFER ALSO TO CITATION(S) 26981, 27187

1306 Environmental Aspects

26977 **(EPRI-WS—80-155) Hydroelectric operation at the river basin level: research needs to include ecological issues in basin-level hydropower planning. Environmental Sciences Division Publication No. 1726.** Hildebrand, S.G.; Goss, L.B. (Oak Ridge National Lab., TN (USA); Science Applications, Inc., Oak Ridge, TN (USA); Tennessee Valley Authority, Chattanooga (USA)). Jun 1981. Contract W-7405-ENG-26. 53p. (CONF-8009162—; ORNL/TM—7776; TVA/OP/EDT—81/24). NTIS, PC A04/MF A01. Order Number DE81025125.

From Workshop on hydroelectric operation at the river basin level: research needs to include ecological issues in basin-level hydropower planning; Oak Ridge, TN, USA (16 Sep 1980).

A workshop to recommend research needed to quantitatively integrate ecological issues in river basin level hydropower planning was held in Oak Ridge, Tennessee, on September 15 to 17, 1980. The 32 workshop participants identified 18 research topics that were responsive to the workshop objective. These topics were related to impacts of water level fluctuation, instream flow requirements, water quality alteration, and impacts on migratory fish. The development of these research topics and recommended research priorities are summarized in this report.

14 SOLAR ENERGY

REFER ALSO TO CITATION(S) 27252

26978 **(SERI/SP—751-1049) National Solar Energy Education Directory: third edition, May 1981.** (Solar Energy Research Inst., Golden, CO (USA)). May 1981. Contract AC02-77CH0178. 288p. NTIS, PC A13/MF A01. Order Number DE81025673.

This directory lists all solar energy or solar-related program and course opportunities offered at the post-secondary level. These fields may encompass any of the following solar energy technologies: active or passive space heating or cooling, domestic hot water, biomass (including alcohol fuel production), ocean energy systems, photoconversion and thermoconversion processes, photovoltaic systems, process heat, solar thermal power, and wind energy systems. The listings are based on information furnished by post-secondary educational institutions in response to a national survey (a copy of the survey instrument is included in Appendix A). This survey has been conducted annually since June 1978. All institutions included in this edition have responded at least once during the last two years; data which is over one year-old is marked.

1401 Resources And Availability

26979 **(SERI/CP—642-977) Insolation resource assessment program contractors annual FY80 review and report.** (Solar Energy Research Inst., Golden, CO (USA)). Oct 1980. Contract AC02-77CH00178. 156p. (CONF-800890—). NTIS, PC A08/MF A01.

From Insulation resource assessment program contractors annual review; Davis, CA, USA (19 Aug 1980).

Work at the Solar Energy Meteorological Research and Training Sites is reviewed. NOAA, SERI, and Canadian insolation assessment and research projects and projects by the national labs and contractors are discussed. (LEW)

26980 (SERI/CP—761-1077(Vol.2), pp 95-99) **Forecast for solar energy application in Morroco.** Alaoui, A. Mar 1981. NTIS, PC A07/MF A01.

From Solar desalination workshop; Denver, CO, USA (23 Mar 1981).

Currently Morocco must import most of its energy needs from abroad in the form of hydrocarbons. A small fraction of its

energy is obtained locally in the form of hydroelectric power and coal. Energy needs are doubling every 7 to 8 years and currently are 6000 Gwh. The population is scattered; rural population is 60% of the total. Solar resources are abundant (3000 hours of sunshine/y; energy density is 2000 Kwh/m^2). In the past few years, great interest has developed in new energy sources, particularly solar. A Center of Development of New Energies has been established in Marrakech. Also, as part of a five year plan (1981 to 1985) a number of demonstration projects covering a wide range of solar energy applications have been initiated. Institutions of higher education are described and current research as well as long range objectives are listed. (MJJ)

1403 Economics

REFER ALSO TO CITATION(S) 27060, 27227, 27254, 27255, 27256, 27264, 27265, 27349, 27350

26981 (DOE/BP—38, pp 38-51) **Evaluation of renewable energy sources in the Pacific Northwest.** Goldenblatt, M.K. (J.B.F. Scientific Corp., Wilmington, MA). 1980. NTIS, PC A07/MF A01.

From 2. annual Pacific Northwest alternative and renewable energy resources conference; Portland, OR, USA (27 Oct 1980).

The Department of Energy and the Solar Energy Research Institute are sponsoring a series of six regional assessment studies (covering the entire country) aimed at identifying both the potential for solar electric technologies and applications that represent the best potential markets with opportunities for early commercialization. The objective of the studies is to identify opportunities for demonstrations and follow-on large- scale use of wind, photovoltaic, solar thermal, ocean thermal, and biomass (direct combustion) in the 1980 to 2000 time period. JBF Scientific conducted the study which analyzed the potential for the above solar technologies in what was defined as the Northwest Region of the United States. This paper will focus on the central station analysis and evaluation that was performed for utilities in the Pacific Northwest only, that is: Oregon, Washington, Montana, Idaho, and Wyoming. The methodology, which was uniquely developed to analyze the performance and economics of solar electric generation for utilities whose capacity is predominantly hydroelectric, will be described first. Following that, the input data and the study results indicating the economic potential of central station solar electric generation to the year 2000 will be presented.

26982 **(NESEC—5) Review of solar-market studies.** McDonald, M. (Northeast Solar Energy Center, Boston, MA (USA)). Jul 1979. Contract AC02-80CS30149. 38p. NTIS, PC A03/MF A01. Order Number DE81026239.

Several of the federally-sponsored solar market studies which have been performed within the past five years are reviewed. Categorized by purpose and methodology, these studies fit into a general typology. The four types included here project economic feasibility, consumer behavior, market penetration and the impacts of federal incentives. Although the methods employed are similar across studies, their projections vary widely. An examination of the assumptions made in the studies reveals that they often lack an empirical basis. The researcher must subjectively estimate future changes in critical variables; the uncertainty of these estimates accounts for the large differences among projections. The adequacy of work to date is evaluated and priorities are suggested for future research. Because the numeric projections of solar potential are bounded by wide margins of error, current market studies are less valuable as predictors than as tools for policy analysis.

26983 **Federal funding programs: farmers home administration financial assistance.** Waldo, L.W. (Farmers Home Administration, Lincoln, NE). pp 6p, Paper 9 of Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

Procedures for obtaining financing for biomass energy projects are outlined in this article. At the present time, there are no loans being made through the Farmers Home Administration due to a change in administrative policy; however, private lending institutions are still loaning money for these projects. How to go about preparing a financial statement and describing the feasibility of the project are explained. (DMC)

26984 **Possible HUD assistance for alcohol plants.** Clements, B. (Dept. of Housing and Urban Development, Omaha, NE). pp 5p, Paper 10 of Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

The Department of Housing and Urban Development currently has three programs which are potential sources of assistance for alcohol plants. These are the Urban Development Action Grant program or UDAG, the Community Development Block Grant program, and a loan guarantee program. Each of these programs is discussed in relation to alcohol production projects. (DMC)

1404 Environmental, Legal, And Institutional Aspects

REFER ALSO TO CITATION(S) 26853, 26999, 27240, 27254, 27256, 27257, 27258, 27259, 27260, 27262, 27266, 27267, 27268, 27812

26985 **(ANL/EES-TM—134) Technology assessment of solar energy systems: local employment impacts of the TASE energy scenarios.** Smeltzer, K.K. (Argonne National Lab., IL (USA)). Nov 1980. Contract W-31-109-ENG-38. 37p. NTIS, PC A03/MF A01. Order Number DE81027141.

The local requirements and impacts of on-site employment by the energy facilities embodied in the high and low solar scenarios of the Technology Assessment of Solar Energy project are analyzed. After presenting an overview of the project and the scenarios it postulated, the report discusses the general energy-related employment consequences of these scenarios and identifies the most important sources of local, on-site energy employment effects. These sources include a wide variety of solar and conventional energy systems whose construction/installation and operation and maintenance employment requirements are summarized from a variety of sources. These employment data, along with the scenarios' projections of energy contributions by each technology type, are used to determine the technology-specific, on-site employment requirements of the scenarios. Finally the likely local social and economic impacts of these requirements are identified and discussed.

26986 **Orographic cloud over the eastern slopes of Mauna Loa volcano, Hawaii, related to insolation and wind.** Garrett, A.J. (Univ. of Hawaii, Honolulu). *Monthly Weather Review ;* **108**: No. 7, 931-941(Jul 1980).

During the period 1 to 11 June 1978, solar radiation and other meteorological data were gathered at eight stations arranged in a nearly linear transection extending from the coast at Hilo, Hawaii to Mauna Loa Observatory, 60 km inland and 3400 m higher. Solar radiation distributions followed climatological rainfall patterns; the driest areas were sunniest. At the wettest sites, underneath the orographic cloud, measured global solar radiation was only 50% of clear-sky potential, and the diffuse component probably accounted for more than 50% of the global radiation. The orographic cloud developed during the day in upslope winds, and sharply reduced afternoon solar radiation at all sites. Total cloudiness, and hence insolation, varied greatly from day to day due to the passage of trade wind cloud masses and jet stream cirrus.

1405 Solar Energy Conversion

REFER ALSO TO CITATION(S) 26956, 26958, 26968, 26971, 26972, 26973, 26974, 26975, 26983, 26984, 27245, 27246, 27335, 27511

26987 **(CONF-810690—1) Application of laser annealing and laser-induced diffusion to photovoltaic conversion.** Young, R.T.; Lowndes, D.H.; van der Leeden, G.A.; Wood, R.F. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 22p. NTIS, PC A02/MF A01. Order Number DE81024125.

From Polycrystalline silicon subcontractors' review meeting; Alexandria, VA, USA (17 Jun 1981).

Major efforts during the past six months were directed toward: (1) the investigation of the electrical properties of individual grain boundaries and the correlation of these properties with the mismatch of grain orientations; (2) the study of the effects of heat treatment on the grain boundaries; (3) the determination of the effects of lithium diffusion on polycrystalline Si slar cells; and (4) the calibration and operation of a Si-CVD system in the temperature range from 400 to 1100°C with SiH_4 and SiH_2Cl_2 as the source gasses.

26988 **Solar-electrics research amd development.** Bailey, R.L. Ann Arbor, MI; Ann Arbor Science Publisher, Inc. (1980). 387p.

The technology of solar generation of electricity in the mid 1970's is surveyed, and the state-of-the-art is integrated. Topics discussed include photovoltaic conversion, wind energy conversion, energy storage, and systems of solar-electrics. Prior work and the current status of these technologies, economic aspects, barriers to their integration, and needed research and development are discussed. 879 references. (LEW)

26989 **(DOE/ET/23197—T1) Semicrystalline casting process development and verification. Quarterly progress report No. 1, June 19, 1980-September 19, 1980.** (Semix, Inc., Gaithersburg, MD (USA)). 1980. Contract FC01-80ET23197. 50p. NTIS, PC A03/MF A01.

Progress reported includes organization of the program plan, and design, construction and experimentation with a prototype crystallization system. Also, the design of a second prototype system is reported as well as experimentation with multi-blade slurry sawing technology. The program will characterize the silicon produced and study the cost potential in order to demonstrate its commercial and technological readiness. The technical and economic performance of the crystallization process will be measured. Quality control by sampling the semicrystalline silicon is planned. (LEW)

26990 **(DOE/JPL—1012-54) Proceedings of the 17th project integration meeting. Progress report 17, September 1980-February 1981.** (National Aeronautics and Space Administration, Pasadena, CA (USA); Jet Propulsion Lab., Pasadena, CA (USA)). 1981. Contract AI01-76ET20356. 505p. (CONF-810255—). NTIS, PC A22/MF A01. Order Number DE81023150.

From Project integration meeting; Pasadena, CA, USA (4 Feb 1981).

Progress is reported on project analysis and integration; technology development in silicon material, large-area silicon sheet and encapsulation; production process and equipment development; engineering; and operations. A report on, and copies of visual presentations made at, the Project Integration Meeting held on February 4 and 5, 1981 are included.

26991 **(DOE/JPL/955131—81/2) Development of methods of producing large areas of silicon sheet by the slicing of silicon ingots using inside-diameter (I.D.) saws. Final report, May 1979-April 1980.** Aharonyan, P. (Silicon Technology Corp., Oakland, NJ (USA)). 1980. Contract NAS-7-100-955131. 27p. NTIS, PC A03/MF A01.

I.D. wafering equipment, blades and processes were used to develop methods for producing large areas of silicon sheet. Modifications to a 16 inch STC automated saw included programmable feed system; crystal rotating system; and STC dyna-track blade monitoring and control system. By controlling the plating operation and by grinding of the cutting edge, we were able to produce 16 inch I.D. blades with a cutting edge thickness of .22 mm. Crystal rotation mechanism was used to slice 100 mm diameter crystals with a 16 inch blade down to a thickness of .20 mm. Cutting rates with crystal rotation were generally slower than with standard plunge I.D. slicing techniques. Using programmed feeds and programmed rotation, maximum cutting rates were from 0.3 to 1.0 inches per minute.

26992 **(DOE/JPL/955696—81/4) Laser annealing of ion-implanted CZ silicon for solar-cell-junction formation. Final report.** Katzeff, J.S. (Lockheed Missiles and Space Co., Inc., Sunnyvale, CA (USA)). Jun 1981. Contract NAS-7-100-955696. 79p. (LMSC/D—798706). NTIS, PC A05/MF A01. Order Number DE81026338.

An investigation was conducted which evaluated the merits of large spot size pulsed laser annealing of phosphorus implanted, Czochralski grown silicon for junction formation of solar cells. The feasibility and requirements were also determined to scale-up a laser system to anneal 7.62 cm diameter wafers at a rate of 1 wafer/second. Laser parameters were developed for optimized performance as substantiated by surface analysis. Functional cells with AM1 conversion efficiencies up to 15.4% for 2 x 2 cm and 2 x 4 cm sizes were attained, and conversion efficiencies ranged up to 14.5% for cells of 7.62 cm diameter. Texture etched surfaces are found incompatible with pulsed laser anneaing due to surface melting. Laser annealed cells are generally found to exhibit conversion efficiencies equal to or better than those of furnace annealed cells. (LEW)

26993 **(NCEI—0032) Vegetable oils as an on the farm diesel fuel substitute: the North Carolina situation. Final report.** Harwood, H.J. (Research Triangle Inst., Research Triangle Park, NC (USA)). Jun 1981. 70p. (FR—41U-1671-4). NTIS, PC A04/MF A01. Order Number DE81903452.

The state-of-the-art of using vegetable oil as a diesel fuel alternative is reviewed. Particular emphasis has been placed on using vegetable oil in farm vehicles as an emergency fuel which may be produced on-farm. The following are reviewed: the mechanical feasibility, on-farm fuel production, and economic analysis.

26994 **(SERI/PR—8002-8-T2) Electrochemical photovoltaic cells: II. VI compound thin-film electrodes. Quarterly technical progress report No. 3, December 1980-February 1981.** Russak, M.A.; Reichman, J.; DeCarlo, J.; Creter, C. (Solar Energy Research Inst., Golden, CO (USA); Grumman Aerospace Corp., Bethpage, NY (USA)). Mar 1981. Contract AC02-77CH00178. 27p. NTIS, PC A03/MF A01. Order Number DE81024433.

Activities are reported in two main research areas, namely, CdSe/sub 1-x//Te/sub x/ thin film electrodes and evaluation of the effect of introduction of Zn into the near surface region of CdSe electrodes on the resultant electrode performance. The efficiency of CdSe/sub 1-x//Te/sub x/ electrodes deposited by the concurrent vacuum evaporation of Cd, Se and Te has been improved to > 5%. The beneficial effect of $ZnCl_2$ treatment on the output parameters of CdSe thin films has been shown repeatedly and several electrodes with eta > 6% produced. The main role of the Zn treatment is a suppression of dark current in the cathodic (forward bias) direction leading to higher V/sub oc/ in all cases and in increased fill factor in some instances.

26995 **(SERI/PR—9080-1-T4) MIS solar cells on thin polycrystalline silicon. Annual report, March 3, 1980-March 3, 1981.** Anderson, W.A. (Solar Energy Research Inst., Golden, CO (USA); State Univ. of New York, Buffalo (USA). Dept. of Electrical Engineering). 31 Mar 1981. Contract AC02-77CH00178. 88p. NTIS, PC A05/MF A01. Order Number DE81025063.

Device processing techniques and the modifications introduced to make reproducible Cr-MIS solar cells are discussed. Current mechanisms due to grain boundaries are explored to identify potential reasons for a loss in efficiency. Capacitance and conductance measurements are also made to quantitatively identify interface states at grain boundaries. The composition of the Cr and I layers in the MIS structure is evaluated. A preliminary study of Cr-MIS cell stability under various conditions is reported. Work on e-beam Si deposition is reported. Surface features are shown by scanning electron microscopy. Impurities were identified by secondary ion mass spectroscopy. X-ray diffraction studies, Sirtle etch studies, and thin film silicon electrical studies are also reported. (LEW)

26996 (SERI/PR—9190-1-T2) Investigation of solar cells based on Cu_2O. Third quarterly report, 1 December 1980-28 February 1981. Olsen, L.C. (Solar Energy Research Inst., Golden, CO (USA); Joint Center for Graduate Study, Richland, WA (USA)). Apr 1981. Contract AC02-77CH00178. 26p. NTIS, PC A03/MF A01. Order Number DE81023074.

Efforts during this quarter concentrated on: (1) studies of the effect of copper purity on Cu_2O resistivity and cell performance; (2) thermodynamic considerations concerning the reaction of chlorine and Cu_2O; (3) investigations of Tl/Cu_2O Schottky barriers. Samples from two different rods of five-nines purity copper were submitted for spark source mass spectrographic analyses. Cu_2O substrates grown from copper wafers cut from the two rods exhibited significantly different resistivities, one much higher than the other. It was determined that the material which yields high resistivity material is characterized by relatively large levels of impurities. Further studies concerned earlier results suggesting that an n-type layer was formed on Cu_2O when reacting the material with vapor from solid $CuCl_2$. It is expected that the n-type layer most likely resulted from Cl_2(g) reacting with Cu_2O. Cu_2O solar cell studies consisted mainly of fabrication and characterization of Tl/Cu_2O Schottky barriers, and related investigations. It was determined that thin thallium films can be deposited with low values of sheet resistance by cooling a substrate to -170°C and depositing a cover layer of SiO. Depth concentration profiles were obtained for Tl/Cu_2O interfaces. These profiles indicate that no Tl-O bonding occurs near the interface, that is, no reduction of Cu_2O is evident. Detailed current-voltage analyses were conducted for Tl/Cu_2O devices. Two current mechanisms are operative. The low voltage mechanism (0 to 0.3 volts) appears to be multiple step tunneling, while the high voltage mechanism (>0.3 volts) is characteristic of thermionic emission through an interfacial layer. Results for Cu/Cu_2O and Tl/Cu_2O cells are utilized to formulate a model for Cu_2O Schottky barriers.

26997 (SERI/TP—613-1220) Advances in the SERI/DOE program on CdS/Cu_2S and CdS/Cu-ternary photovolaic cells. Leong, J.; Deb, S. (Solar Energy Research Inst., Golden, CO (USA)). May 1981. Contract AC02-77CH00178. 6p. (CONF-810526—31). NTIS, PC A02/MF A01. Order Number DE81025858.

From 15. IEEE PV specialists conference; Orlando, FL, USA (11 May 1981).

The most significant achievement under the SERI CdS/Cu_2S and Cu-Ternary program is the development of two new high efficiency thin film cells, a frontwall Cu_2S/(Cd,Zn)S cell by the Institute of Energy Conversion, University of Delaware, and a backwall CdS/$CuInSe_2$ cell by the Boeing Aerospace Company. The reported AMl efficiencies for these two devices are 10.2% and 9.5%, respectively. A 5.7% Cu_2S/CdS cell with Cu_2S sputter deposited by the Telic Corporation was also fabricated within the last year. A program to study the problem of instability in the Cu_2S/CdS cell has been initiated at Battelle-Columbus Laboratories.

26998 (SERI/TP—613-1224) Advances in the SERI-DOE Electrochemical Photovoltaic Cell program. Wallace, W.; Noufi, R.; Deb, S. (Solar Energy Research Inst., Golden, CO (USA)). May 1981. Contract AC02-77CH00178. 8p. (CONF-810526—34). NTIS, PC A02/MF A01. Order Number DE81025908.

From 15. IEEE PV specialists conference; Orlando, FL, USA (11 May 1981).

The Electrochemical Photovoltaic Cell program supported by the Department of Energy through the Solar Energy Research Institute presently consists of sixteen subcontracted research programs at a total funding level of approximately 2.1 million dollars. The objective of this program is to evaluate the photovoltaic energy conversion efficiency, stability and storage potential of amorphous and polycrystalline semiconductor/electrolyte systems with the goal of developing a 10% AM1 efficiency solar cell with demonstrated stability potential. Current research efforts are directed toward technologies capable of the conversion of light energy into electrical energy either directly in regenerative electrochemical photovoltaic devices or indirectly in overall regenerative cyclic systems incorporating storage. The ultimate goal of the program is to develop and demonstrate the viability of low cost electrochemical photovoltaic cells competitive with solid state photovoltaic devices and photoelectrochemical storage systems competitive with battery-connected photovoltaic array storage.

26999 (SERI/TR—743-799) Environmental, health, safety, and regulatory review of selected photovoltaic options: copper sulfide/cadmium sulfide and polycrystalline silicon. Lawrence, K.; Morgan, S.; Schaller, D.; Wilczak, T. (Solar Energy Research Inst., Golden, CO (USA)). Jun 1981. Contract AC02-77CH00178. 240p. NTIS, PC A11/MF A01. Order Number DE81027294.

Current laboratory processes and potential commercial-scale PV cell fabrication approaches are described. Emissions, effluents and solid wastes from the fabrication of both polycrystalline silicon and front-wall copper sulfide/cadmium sulfide photovoltaic cells are summarized. Environmental, health, and safety characteristics of cell fabrication material inputs and by-products are listed. Candidate waste stream treatment methods and resultant effluents are reviewed. Environmental, health, and safety effects of photovoltaic cell/module/array installation, operation, maintenance, and decommission are summarized. An overview is presented of federal laws, regulations, and guidelines that may apply to a commercial-scale industry for either cell process. Federal legislation addressed includes: the Clean Air Act, Clean Water Act, Occupational Health and Safety Act, Resource Conservation and Recovery Act, Safe Drinking Water Act, Toxic Substances Control Act, Hazardous Materials Transportation Act, and the National Environmental Policy Act. Future regulatory trends under these laws are discussed as they may affect each cell process. Water quality, solid waste disposal, and occupational health and safety regulations will likely be those most applicable to commercial-scale PV production. However, currently available control technology appears sufficient to treat cell fabrication wastes. Final determinations of PV industry compliance with these regulatory programs awaits quantitative data from demonstration and commercial-scale facilities.

27000 (SERI/TR—8041-2-T2) Plasma-assisted CVD of fluorinated, hydrogenated amorphous silicon. Final report. Coleman, J.H.; Hammes, J.P.; Wiesmann, H.J. (Solar Energy Research Inst., Golden, CO (USA); Plasma Physics Corp., Locust Valley, NY (USA)). 1981. Contract AC02-77CH00178. 42p. NTIS, PC A03/MF A01. Order Number DE81023952.

During the past year, three novel large-area (100 cm^2) a-Si:H solar cells were developed with the following configurations: inverted NIP/SS cells with an improved red response; inverted a-Si:H/a-B:H heterojunction cells with high V/sub oc/; and NIP/metal cells with a CVD P-layer grown pyrolytically from silane and diborane. Initial experiments were performed using disilane as the deposition gas for the intrinsic layer in both NIP/SS and PIN/SS structures. Coatings of In_2O_3, using a technique developed by Dr. Ovadyahu, were applied to NIP/SS cells in order to evaluate its potential as a conductive coating in practical amorphous silicon solar cells.

27001 (SERI/TR—8104-2-T4) Commercialization of a thick-film solar cell. Final technical report, September 15, 1980-April 30, 1981. McDonald, G.D. (Solar Energy Research Inst., Golden, CO (USA); Johnson Controls, Inc., Milwaukee, WI (USA)). 1981. Contract AC02-77CH00178. 81p. NTIS, PC A05/MF A01. Order Number DE81025537.

No technical problems were encountered in the preparation of screen printed cadmium sulfide layers. High conductivity (less than 5 ohm cm resistivities) adherent layers could be produced on 7059 glass, Nesatron and tin oxide coated glass. No macro pinholes were observed in thick films. Solar cells produced from screen printed CdS had a maximum open circuit voltage of 0.44 volt and a maximum observed short circuit current of 8 ma/cm^2 under AM 1 illumination. A maximum cell efficiency of 2.2% was obtained. This performance is not felt to be a limitation produced by the screen printing approach but to be reflective of an unoptimized procedure for producing Cu_2S on the CdS film and the lack of a suitable post thermal treatment technique.

27002 (SERI/TR—9133-1-T2) High efficiency thin film CdTe solar cells. Final progress report, April 1, 1980 to March 31, 1981. Serreze, H.B.; Reiff, G.; Johnson, B.; Lis, S.; Squillante, M.; Entine, G.; Goldner, R.B. (Solar Energy Research Inst., Golden, CO (USA); Radiation Monitoring Devices, Inc., Watertown, MA (USA)). Apr 1981. Contract AC02-77CH00178. 41p. NTIS, PC A03/MF A01. Order Number DE81024320.

Thin films of n and p-type CdTe have been deposited onto both crystalline and non-crystalline substrates using a hot-wall, multiple source, vacuum evaporation process. N-type films have utilized both indium and halogen doping, and p-type films, antimony doping. For substrate temperatures up to approximately 400°C, grain size appears limited by the crystallographic nature of the substrate to approximately one micron. Front-wall illuminated, Schottky barrier solar cells utilizing semitransparent gold contacts on n-type CdTe have been fabricated up to 1 cm^2 area, and appear capable of at least 3% AM1 conversion efficiency. High reverse saturation current density seems to be the primary limit to improved performance. Low resistivity, p-type films utilizing Sb doping have also been reproducibly obtained, and, in spite of low apparent dopant activation, possess encouraging electrical characteristics.

27003 Behavior of some n-type unmodified and chemically modified metal oxide electrodes in nonaqueous solvents. Kabir-ud-Din; Owen, R.C.; Fox, M.A. (Univ. of Texas, Austin). *Journal of Physical Chemistry ;* **85**: No. 12, 1679-1682(11 Jun 1981).

Flat-band positions of several n-type semiconductor electrodes (single-crystal and polycrystalline TiO_2, polycrystalline SnO_2, and chemically modified SnO_2) have been measured by determining capacitance-voltage dependence or the onset of photopotential in five nonaqueous solvents. The effects which give rise to deviations from ideality in Schottky-Mott plots apparently cause significant differences in flat-band potentials measured by these two techniques. For metal oxide semiconductor electrodes, interface energetics are not dramatically altered by derivatization.

27004 Energy analyses of forestry practices in oak-pine forests and loblolly pine plantations. Klopatek, J.M. (Oak Ridge National Lab., TN); Risser, P.G. Contract W-7405-ENG-26. *Forest Science ;* **27**: No. 2, 365-376(Jun 1981).

Evaluation of regional management strategies for natural resources requires a common value system for measuring costs and benefits. Energy values were used to characterize and model the comparative inputs and outputs associated with mixed oak-pine forests and loblolly pine plantations in McCurtain County, Oklahoma. An energy model of the forestry industry in the county was also constructed. Expressing all types of energy as fuel equivalents (FE) permitted the calculation of energy costs for logging, land conversion, and plantation maintenance. The calculated costs of logging mixed forests and pine plantations were 11.0 x 10^6 kcal FE/ha and 12.2 x 10^6 kcal FE/ha, respctively. Converting land to pine plantations required 8.2 x 10^6 kcal FE/ha, and maintaining the plantation for 30 years required 0.03 x 10^6 kcal FE/ha. Harvested mixed-forest and pine plantation biomass amounted to 113.8 x 10^6 kcal FE/ha and 232.0 x 10^6 kcal FE/ha, respectively. The ratio of energy outputs to energy inputs was 9.0 for the mixed-forest and 9.4 for pine plantation management strategies. If solar energy is included in these ratios, the quotient was 0.31 for the mixed forest and 0.95 for the pine plantation. This 3:1 energy advantage for the pine plantation indicates the positive potential of amplifying energy subsidies while still maintaining a favorable output/input energy ratio.

27005 Stabilization of n-type silicon photolectrodes to surface oxidation in aqueous electrolyte solution and mediation of oxidation reaction by surface-attached organic conducting polymer. Noufi, R.; Frank, A.J.; Nozik, A.J. (Solar Energy Research Inst., Golden, CO). *Journal of the American Chemical Society ;* **103**: No. 7, 1849-1851(8 Apr 1981).

A procedure is described for the electrodeposition of polypyrrole films on the surface of n-type silicon photoelectrodes. These films protect the Si electrode against SiO_2 formation. The films are shown to produce dramatic improvement in the stability of the electrodes against photooxidation in aqueous solutions, with the photocurrent of uncoated electrodes dropping precipitiously to zero from its initial value after < 30 while the current of the coated electrodes loses about 6% of its photocurrent over the first 5h of decay but only 30% during 122h of irradiation. (BLM)

27006 Photosensitized electron transport across lipid vesicle walls: enhancement of quantum yield by ionophores and transmembrane potentials. Laane, C.; Ford, W.E.; Otvos, J.W.; Calvin, M. (Lawrence Berkeley Lab., CA). *Proceedings of the National Academy of Sciences of the United States of America ;* **78**: No. 4, 2017-2020(Apr 1981).

The photosensitized reduction of heptylviologen in the bulk aqueous phase of phosphatidylcholine vesicles containing EDTA inside and a membrane-bound tris(2,2'-bipyridine)ruthenium(2+) derivative is enhanced by a factor of 6.5 by the addition of valinomycin in the presence of K^+. A 3-fold stimulation by gramicidin and carbonyl cyanide m-chlorophenylhydrazone is observed. The results suggest that, under these conditions, the rate of photoinduced electron transfer across vesicle walls in the absence of ion carriers is limited by cotransport of cations. The rate of electron transfer across vesicle walls could be influenced further by generating transmembrane potentials with K^+ gradients in@the presence of valinomycin. When vesicles are made with transmembrane potentials, interior more negative, the quantum yield of heptylviologen reduction is doubled, and, converseley, when vesicles are made with transmembrane potentials, interior more positive, the quantum yield is decreased and approaches the value found in the absence of valinomycin.

27007 Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981). 210p. (CONF-810384—).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

This proceedings contains papers presented at the conference. The purpose of the conference was to present an overview of activities in the areas of fuel research, fuel utilization, and marketing which have taken place over the past year in order to gain a better understanding of the current status of ethanol production and utilization. Separate abstracts have been prepared for individual papers which are within the scope of the Energy Data Base. (DMC)

27008 Fodder beets as an energy crop. Barney, W.K. (Argonne National Lab., Idaho Falls). pp 7p, Paper 8 of Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

Test plots of fodder beets were planted in Idaho to determine if high sugar yields could be achieved. Results were encouraging and additional plantings are planned. Fodder beets are less expensive than sugar beets and may be a suitable feedstock for alcohol production. (DMC)

27009 Vegetable oils for diesel fuel. Kaufman, K.R. (North Dakota State Univ., Fargo). pp 9p, Paper 18 of Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

The use of vegetable oils extracted from sunflower seeds as a substitute for diesel fuel is discussed. Processing techniques are described and the economics and energy balance are favorable. The results of short-term testing at North Dakota State University using a Ford 7000 tractor and an Allis-Chalmers 7010 tractor are presented. The long-term use of vegetable oils in farm tractors is neither economically nor technically feasible at present. Nevertheless, vegetable oils or their esters may be used on a short-term basis in an emergency situation. There is a favorable energy output/input ratio with the production of vegetable oils.

27010 **[Integrated energy management on farms].** Splinter, W.E. (Univ. of Nebraska, Lincoln). pp 10p, Paper 19 of Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

The general concept of this demonstration involves the use of state-of-the-art technology in an attempt to achieve zero flow of direct and indirect petroleum input into the farming operation. Specific objectives of the project include: demonstration of energy-saving irrigation practices, including irrigation scheduling, low-pressure center-pivot and gated-pipe irrigation systems; use of ethanol produced from sweet sorghum as a replacement for fuel in farm engines; reduced tillage and fertilizer for energy, soil and water conservation; demonstration of solar energy and methane gas usage in an integrated fashion for electricity production and for hot-water heating and space heating in a swine-production facility; use of mini- and micro-computer technology for on-farm energy conservation and management; recovery of waste heat and carbon dioxide from alcohol fermentation and swine production for greenhouse production of vegetables; and demonstration of energy conservation practices in all aspects of farming operations. The demonstration farm encompasses 63.5 hectares (157 acres) at the University of Nebraska Field Laboratory near Mead, Nebraska. A crop rotation of corn, soybeans and sweet sorghum is planned as part of the energy and soil conservation system for the farm. Approximately 2 hectares (5.0 acres) of the farm is reserved for farmstead operations. These include: a 10-sow, farrow-to-finish swine facility; a 760-litre (200 gal) per batch alcohol fermentation/distillation unit;a methane-gas production unit; and crop drying and processing facilities. Energy-saving, low-pressure center-pivot and gated-pipe irrigation will be important features of this demonstration project. Power for pumping water to these systems will be provided by alcohol-fired LP gas engines.

27011 **Analysis of extractables from one euphorbia.** Nemethy, E.K.; Otvos, J.W.; Calvin, M. (Lawrence Berkeley Lab., CA). Contract W-7405-ENG-48. *Journal of the American Oil Chemists Society ;* **56**: No. 12, 957-960(Dec 1979).

Chemical analyses have been made of the heptane extractable material of Euphorbia lathyris, a plant which has been proposed as an energy farm candidate. The heptane extract is 4 to 5% of the dry plant weight and has a heat value of ~ 18 x 10^3 Btu/lb. This reduced photosynthetic material consists almost entirely of polycyclic triterpenoids. 2 figures, 4 tables.

27012 **Petroleum plantations for fuel and materials.** Calvin, M. Contract W-7405-ENG-48. *Bioscience ;* **29**: No. 9, 533-538(Sep 1979).

The possibility for the development of an economically useful solar energy and materials system is an outgrowth of, and in a sense, a return to, an older system. The best existing solar energy-capturing device known, the green plant can be used by selecting and modifying it to produce the materials wanted, namely, hydrocarbons of suitable molecular weight and structure. The choice of plant(s) will depend on growth rates and habits, hydrocarbon productivity and harvest adaptability, as well as process development. Experiments have indicated the economic feasibility of the production of oil from hydrocarbon-producing plants, particularly species of Euphorbia and Asclepias. With the continued increase in cost of petroleum from fossilized photosynthetic residues and the continued decrease of its availability, the development of this alternate energy source becomes absolutely necessary. 11 figures, 2 tables.

1406 Photovoltaic Power Systems

REFER ALSO TO CITATION(S) 27040

27013 **Status of the satellite power system concept development and evaluation program.** Koomanoff, F.A. (Dept. of Energy, Washington, DC); Sandahl, C.A. *Space Solar Power Review ;* **1**: 67-77(1980).

This article presents the status of the joint Department of Energy (DOE) and the National Aeronautics and Space Administration (NASA) Satellite Power System (SPS) Concept Development and Evaluation Project (CDEP) as of October 1979. The evaluation procedure is described including the definition of the Reference System for which the assessments (environmental, societal, and comparative) are being made. The provisions for public involvement and information organization and dissemination are described. Some preliminary findings are presented.

1407 Solar Thermal Power Systems

REFER ALSO TO CITATION(S) 26981, 27013, 27066, 27068, 27762

27014 (CONF-801055—, pp 84-88) **Solar thermal power storage applications lead laboratory overview.** Radosevich, L.G. (Sandia National Labs., Livermore, CA). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

An overview is presented of activities for the applications elements of the Thermal Energy Storage for Solar Thermal Applications (TESSTA) program. The TESSTA program which was initiated in FY80 is organized through a work breakdown structure which includes the development of thermal storage technologies matched to solar thermal power system requirements for several near-term applications. The status of the technology development activities ongoing in FY80 is presented here along with plans for FY81.

27015 **(DOE/ET/20524—T1) Conceptual design and analysis of a 100-MWe distributed line-focus solar central power plnt. Volume II. Technical report. Final report, September 29, 1978-September 30, 1979.** Semmens, M.G.; Fong, A.; Collaros, G.J.; Dascher, R.E.; Grassberger, R.E.; Griego, D.B. (BDM Corp., Albuquerque, NM (USA)). 1979. Contract AC03-78ET20524. 624p. NTIS, PC A99/MF A01.

A parametric analysis is done for each subsystem of the line focus power plant. The system analysis and selection involved array layout optimization, system characterization and sensitivities, and sizing for selection of the optimal 100 MWe plant. The conceptual design of the line-focus power plant is described. Analyses of the performance and cost of the plant are summarized. Testing to verify the efficiency of the solar collector was done. The commercial assessment of the plant was performed to estimate the future cost of the plant and conventional power technologies, identify the regions and the time periods in which the plant becomes a cost effective alternative and ultimately to assess the market for utility and non-utility applications. Issues in component and system development are discussed. Thirteen appendices more completely describe the design, alternatives, and analyses of the system. (LEW)

27016 **(DOE/ET/20567—T2) Solar central receiver hybrid power system. Monthly technical progress report, March 1979.** (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). Apr 1979. Contract AC03-78ET20567. 47p. NTIS, PC A03/MF A01.

The preliminary market assessment for the sodium-cooled solar central receiver hybrid plant is reported, and calculations of the levelized bus bar costs of electric power produced by coal and coal-solar hybrid units have been updated. An investigation of such alternate fuels as coal gas, coal liquids, and shale oil leads to the conclusion that, despite the disadvantages of the direct burning of coal, synthetic fuels are too expensive to be feasible. Additional studies of the optimum size for the collector field, tower, and receiver were carried out. A preliminary design of a combustion gas exhaust stack that uses the central tower for structural support was completed. Also a preliminary design of the sodium heater was completed to the point at which more detailed costing could be started. (LEW)

27017 **(DOE/ET/20567—T3) Solar central receiver hybrid power system. Monthly technical progress report, February 1979.** (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). Mar 1979. Contract AC03-78ET20567. 76p. NTIS, PC A05/MF A01.

The three best regions for marketing a solar hybrid plant were studied. These are: East South Central, Rocky Mountain, and Pacific regions. The base load and intermediate load markets appear to be approximately 90 giga watts. The economic analysis made by SRI shows that a coal fired hybrid plant is economically competitive with pure coal plants for fuel escalation rates above 9% per year. For example: at 10% per year escalation the hybrid plant BBEC is 67 mils/Kwh compared to 70.7 mils/Kwh for a typical coal plant. The optimization studies conducted by McDonnell Douglas on the field geometry, tower height, and receiver dimensions are converging on an optical tower height of 120 m, 7332 heliostats and a receiver which is 10 m in diameter and 12 m high. One more iteration should fix the optical geometry for the 100 MWe plant with a solar multiple (S.M.) of 0.8. The preliminary values of the performance and design data sheets for the 100 MWe 0.9 S.M. hybrid base line plant have been prepared.

27018 **(DOE/ET/20567—T4) Solar central receiver hybrid power system. Monthly technical progress report for the month of December 1978.** (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). 17 Jan 1979. Contract AC03-78ET20567. 85p. NTIS, PC A05/MF A01.

Levelized busbar energy costs for the sodium-cooled hybrid central receiver concept using both oil and coal as a fuel were developed as a function of the plant capacity factor and as a function of the solar multiple. The fuel escalation question was reviewed in detail on the basis of past historical data, and it was concluded that the lower escalation numbers that are provided in the requirements definition document appear to be more likely to represent the real situation. Subsystem-level trade studies were continued during this reporting period. A detailed investigation of the series/parallel arrangement of the sodium heater and solar receiver was conducted. The various performance, lifetime, and cost factors were determined for each arrangement for the receiver and nonsolar subsystems, respectively. Collector subsystem studies were continued. Revised cost algorithms that include levelized O and M costs for the heliostats were generated in order that they can be used in the field optimization. On the basis of the subsystem studies and the economic assessment work, a reference configuration was tentatively derived. This configuration does not require storage and uses a parallel arrangement of the receiver and the heater. At this time, a coal-fired heater seems to have a potential economic advantage under realistic assumptions for the escalation of coal relative to oil over the next decade or so.

27019 **(DOE/JPL—1060-45) Solar thermal power systems: parabolic dish project. Annual technical report, Fiscal Year 1980.** (Jet Propulsion Lab., Pasadena, CA (USA); National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 15 May 1981. Contract AT04-81AL16228. 94p. NTIS, PC A05/MF A01. Order Number DE81026226.

The status of the JPL Solar Thermal Power Systems Project is summarized. Included is a discussion of the project's goals, program structure, and progress in parabolic dish technology. Analyses and test results of concentrators, receivers, and power converters are discussed. Progress toward the objectives of technology feasibility, technology readiness, system feasibility, and system readiness are covered.

27020 **(MCR—79-1333) Solar central receiver hybrid power system. Phase I.** (Martin Marietta Corp., Denver, CO (USA)). Jun 1979. Contract AC03-78ET21038. 305p. NTIS, PC A14/MF A01.

An analysis was performed to identify the market for solar hybrid technology. Future power capacity additions for nine US geographic regions were identified and an assessment of potential hybrid penetration was performed. Costs of various power systems were established for the nine regions for the year 1990 to establish target breakeven costs for hybrid technology. Cost/benefit ratios of hybrid technology were calculated for first generation hybrid technology (steam receiver, no storage). Parametric analyses on hybrid subsystems were performed to develop cost, preliminary design and performance data for the preferred system selection. Cost and performance data were developed for: collector/receiver modularity; salt piping and heat exchangers; salt thermal storage; nonsolar energy generator and support systems; solar/nonslar interface; and the electrical power generation system. Results indicate that multiple modules become cost effective beyond a base of the tower's power output of 900 MWt, (equinox noon). The objectives of the subsystem and system analyses are to select a baseline hybrid configuration which: results in costs which are competitive with conventional power plants at intermediate and/or baseload capacity factors; minimizes operating and maintenance costs; minimizes the cost-to-benefit ratio for a utility and minimizes the effects of penetration on this ratio; achieves operational simplicity during solar/nonsolar transition; and maximizes fossil fuel displacement. The selected baseline configuration is reported to meet all of these objectives. (LEW)

27021 **(PNL—3533-Vol.2) Assessment of generic solar thermal systems for large power applications. Volume II. Analysis of thermal energy production costs for systems from 50 to 600 MWt.** Bird, S.P.; Apley, W.J.; Barnhart, J.S.; Brown, D.R.; Drost, M.K.; Fort, J.A.; Garrett-Price, B.A.; Williams, T.A. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jun 1981. Contract AC06-76RL01830. 125p. NTIS, PC A06/MF A01. Order Number DE81025674.

A comparative analysis of solar thermal concepts that are potentially suitable for development as large process heat systems (50 to 600 MWt) was performed. The concepts considered can be classified into three categories based on the type of solar tracking used by the collector: (1) two-axis tracking, in which concentrators track the sun's motion in both azimuth and altitude; (2) one-axis tracking, in which concentrators track changes in either azimuth or altitude; and (3) non-tracking, in which the concentrators are fixed. Seven generic types of collectors were considered. Conceptual designs developed for the seven systems were based on common assumptions of available technology in the 1990 to 2000 time frame. Costs were estimated on the basis of identical assumptions, ground rules, methodologies, and unit costs of materials and labor applied uniformly to all of the concepts.

27022 **(SAN—0499-22) Collector-field optimization report (RADL item 2-25).** (McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA)). Oct 1979. Contract AC03-79SF10499. 169p. (MDC-G—8214). NTIS, PC A08/MF A01.

The range of capabilities of the available optimization and performance computer codes is described. The various loss models included in the analysis are described. The detailed cost model used by the optimizer for the commercial system optimization is presented. The design basis for the commercial system is presented together with the rationale for its selection. The individual heliostat (IH) code was used successfully in defining the precise scaling relationship to the pilot plant needed to provide the required power level. Use of the IH code in a completed study of receiver panel power under sunrise startup conditions is described. The procedure is described whereby performance and heliostat spacing data from the representative commercial-scale system converted into coefficients of use in the layout processor. The objective is to emulate as closely as possible the performance for each region of the field. The actual procedure used in the layout processor is described. Numerous special studies are described. The three appendices provide a description of the optimization theory, the layout procedure, and the individual heliostat code. (LEW)

27023 **(SAND—80-2394C) Line-focus concentrating solar collectors.** Leonard, J.A.; Dugan, V.L. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 9p. (CONF-810802—1). NTIS, PC A02/MF A01.

From Conference on new and renewable energy sources; Nairobi, Kenya (Aug 1981).

An overview of the line-focus concentrating solar collector technology and applications is presented. Included are a description of the collectors, some of the key features of the engineering approach, instantaneous and all-day performance and operating data, temperature capabilities and limitations for selected collectors, projected future capabilities for peak and annual performance. Projected system capital costs and annualized life cycle costs for thermal

energy produced are discussed. Several existing application projects which employ line concentrating collectors are reviewed, and finally, plans for future DOE-funded line concentrating collector projects are described.

27024 **(SAND—81-8180) Thermal performance, dynamic stability, and thermal-stress cycling analysis of radiation-heated boiler tubes based on a 5-tube panel test.** Wolf, S.; Lo, D. (Sandia National Labs., Albuquerque, NM (USA); General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.). Jan 1981. Contract AC04-76DP00789. 94p. (ARSD—00086-2). NTIS, PC A05/MF A01. Order Number DE81024277.

Thermal performance of a radiation heated boiler panel is reported. Both experimental and analytical results are given. The experimental data are from a 5-tube radiation heated boiler panel test conducted by Sandia National Laboratories. The test panel geometry incorporates design features used for the Barstow 10-MWe solar-electric pilot power plant, and test conditions include simulated pilot plant operating conditions. Thermal performance predictions with computer models are compared with selective data. Overall thermal performance and axial distribution of temperatures and absorbed heat flux are predicted with a steady-state code which includes parameters to take into account two-dimensional effects resulting from nonuniform circumferential heating of the tubes. Differential pressure and temperature oscillations observed in parts of the data are identified as characteristic of density-wave dynamic channel instability. Selective experimentally determined unstable conditions are also predicted to be unstable with a state-of-the-art dynamic stability code, STEAMFREQ-I. The code is a frequency domain model. Stability threshold conditions are predicted and are shown to compare well with the corresponding experimental values. The temperature oscillations are simulated with a two-dimensional thermal model. A generalized plane strain elastic model is used for the stress analysis leading to fatigue life predictions. The results yield a conservative fatigue life prediction of 22.9 years, which is less than the 30-year design life of the solar pilot plant.

27025 **(SAND—81-8181) Thermal performance and dynamic stability evaluation of solar pilot plant receiver panel test at CRTF.** Wolf, S.; Hernandez, E.A. (Sandia National Labs., Albuquerque, NM (USA); General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.). Jan 1981. Contract AC04-76DP00789. 43p. (ARSD—00088). NTIS, PC A03/MF A01. Order Number DE81024278.

Thermal performance of a solar-heated boiler panel is reported. Both experimental and analytical results are given. The experimental data are from a 70-tube solar-heated boiler panel test conducted at the 5-MW Central Receiver Test Facility operated by Sandia National Laboratories. The test panel geometry incorporates design features used for the Barstow 10-MWe solar-electric pilot power plant, and test conditions include simulated pilot plant operating conditions. Thermal performance predictions with computer models are compared with selective data. Overall thermal performance and axial distribution of temperatures and absorbed heat flux are predicted with a steady-state code which includes parameters to take into account two-dimensional effects resulting from nonuniform circumferential heating of the tubes. Differential pressure and temperature oscillations observed in parts of the data are identified as characteristic of density-wave dynamic channel instability. Selective experimentally determined unstable conditions are also predicted to be unstable with a state-of-the-art dynamic stability code, STEAMFREQ-I. Dynamic instability induced oscillations are shown to disappear during a test conducted with 1.85-mm (0.073 in.) tube inlet orifices for the pilot plant at approximately 100% receiver panel maximum power. However, in this case severe control system fluctuations are identified.

27026 **(SAND—81-8216) International Energy Agency Small Solar Power Systems (SSPS) project review, January 1981.** Baker, A.F. (Sandia National Labs., Livermore, CA (USA)). May 1981. Contract AC04-76DP00789. 65p. NTIS, PC A04/MF A01. Order Number DE81025047.

The International Energy Agency Small Solar Power System Project being built in the Province of Almeria, Spain is reviewed from its beginning to January 1981. It provides background on the project and a definition and technical description of the main subsystems for the Central Receiver System and Distributed Collector System which are included in the project. The current status of the planning for the tests and operation phase of the project are discussed. These two solar powered electric plants are scheduled to begin operation in August 1981.

27027 **(DOE/ET/20524—1(Vol.1)) Conceptual design and analysis of a 100-MWe distributed line focus solar power plant. Final report.** (BDM Corp., Albuquerque, NM (USA)). [nd]. Contract AC03-78ET20524. 269p. NTIS, PC A12/MF A01. Order Number DE81025991.

The following are included: executive summary, program overview, subsystem parametric analysis, system analysis and selection, conceptual design, and performance and cost summary. (MHR)

27028 **(DOE/ET/20524—1(Vol.2)) Conceptual design and analysis of 100-MWe distributed line focus solar power plant. Final report.** (BDM Corp., Albuquerque, NM (USA)). [nd]. Contract AC03-78ET20524. 336p. NTIS, PC A15/MF A01. Order Number DE81025572.

The following are included: collector experimentation, commercial assessment, development issues, and appendices.

1408 Ocean Thermal Gradient And Salinity Gradient Power Systems

27029 **(CONF-8010198—1) Ocean energy resources: the impact of OTEC.** Ditmars, J.D. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 10p. NTIS, PC A02/MF A01. Order Number DE81023916.

From Conference on climate and offshore energy resources; London, UK (21 Oct 1980).

The status of OTEC technological development is summarized with emphasis on the potential impacts of OTEC power production on the ocean environment, including implications for impacts to climate. (MHR)

27030 **(DOE/ET/20612—3) Gulf of Mexico numerical model. Project summary.** Blumberg, A.F.; Mellor, G.L.; Herring, H.J. (Dynalysis of Princeton, NJ (USA)). Feb 1981. Contract AC02-78ET20612. 21p. NTIS, PC A02/MF A01. Order Number DE81025554.

An efficient three-dimensional, time dependent prognostic model of the Gulf of Mexico has been developed. The model is driven by winds and surface heat flux derived from climatological, atmospheric surface data, the result of an intensive data analysis study. Mean velocity, temperature, salinity, turbulence kinetic energy and turbulence macroscale are the prognostic variables. Lateral boundary conditions for temperature and salinity and geostrophically derived velocity at the Straits of Yucatan and Florida are obtained from climatological ocean data. An analytical second moment turbulence closure scheme embedded within the model provides realistic surface mixed layer dynamics. Free surface elevation distributions are calculated with an algorithm which calculates the external (tidal) mode separately from the internal mode. The external mode, an essentially two-dimensional calculation, requires a short integrating timestep whereas the more costly, three-dimensional, internal mode can be executed with a long step. The result is a fully three-dimensional code which includes a free surface at no sacrifice in computer cost compared to rigid lid models.

27031 **(DOE/NOAA/OTEC—37) OTEC LSCT study, additional work. Final report.** (Delta Marine Consultants, Gouda (Netherlands)). Dec 1980. Contract AI01-79CS20396. 153p. NTIS, PC A08/MF A01.

In the final stage of the Large Systems Construction Techniques (LSCT) study, work on the elastomer cold water pipe and on the design of power modules for the Sparmod platform concept was performed. Six different configurations of pipe are compared, and the pressure difference between the outside and inside of the pipe is analyzed. Static forces in the membrane are also discussed. Calculation of the strength and stability of concrete rings are done. The forces, membrane materials and connection details of the elas-

tomer membrane of the pipe are discussed. Construction and handling of the pipe and rings are discussed, and a rough breakdown of the costs for a 30 m diameter pipe is given. The consequences of the sparmod principles to the OTEC-plant design are investigated. Conceptual design of a 50 MW power module for the 400 MW sparmod design was done, followed by a construction and installation plan. Conceptual design of a 50 MW and 100 MW Plant based on the sparmod principle is done to investigate the influence of scale. (LEW)

1409 Solar Thermal Utilization

27032 **(BNL—29626) Test results of prototype solar assisted heat pumps.** Catan, M.A.; Kush, E.A. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 8p. (CONF-810812—23). NTIS, PC A02/MF A01. Order Number DE81024367.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

Results of steady state tests of a prototype solar-assisted heat pump using the BNL Simulator are reported. Results demonstrate that the nominal goal for the project, construction of a prototype capable of achieving a heating coefficient of performance (COP) of 6 at an entering water temperature of 32°C (90°F), has been achieved. Factors related to reliability and potential for performance improvement of the design are treated. Plans for future testing and application of performance data to system studies are discussed.

27033 **(BNL—29627) Solar energy and heat pumps: can this marriage be saved.** Andrews, J.W. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 10p. (CONF-810812—26). NTIS, PC A02/MF A01. Order Number DE81024371.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

Work on systems for building space and water heating and space cooling which combine vapor-compression heat pumps with the use of solar energy has led to promising system configurations which portend reasonable cost and beneficial impact on utility load profiles in addition to conserving energy. This paper presents a historical perspective on this work, elucidates the ranges of system possibilities, and describes two promising systems in more detail.

27034 **(BNL—29679) Solar-heat-pump simulator.** Catan, M.A. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 7p. (CONF-810672—24). NTIS, PC A02/MF A01. Order Number DE81024370.

From DOE heat pump contractors' program integration meeting; McLean, VA, USA (2 Jun 1981).

A solar assisted heat pump (SAHP) hardware simulator was constructed to demonstrate the potential of the vapor compression heat pump to obtain high COP's at high source temperatures, to explore the means to obtain such high efficiencies, and to test prototype hardware resulting from the SAHP development program. The original water coolant system which simulated heating loads was upgraded to accommodate liquid to air heat pumps. A further refinement to the simulator was the addition of a on-line data acquisition and reduction facility. Testing of an experimental mockup heat pump designed to operate efficiently under SAHP system conditions demonstrated that very high COP's can be achieved with conventional components. One prototype marketable SAHP constructed by Northrup has been tested under steady state conditions using the simulator.

27035 **(BNL—29681) Technical support: solar assisted heat pump systems.** Andrews, J.W. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 10p. (CONF-810672—23). NTIS, PC A02/MF A01. Order Number DE81025091.

From DOE heat pump contractors' program integration meeting; McLean, VA, USA (2 Jun 1981).

Technical and program planning assistance provided in connection with the development of energy conserving and cost effective solar-assisted heat pump systems is reviewed. The background of the program is outlined. (MHR)

27036 (CONF-801055—, pp 154-158) **Chemical heat pump based on the reaction of calcium chloride and methanol for solar heating, cooling and storage.** Offenhartz, P.O'D. (EIC Labs., Inc., Newton, MA). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

Tests have been completed on an engineering development test prototype of the $CaCl_2$-CH_3OH chemical heat pump. The unit, which has a storage capacity in excess of 100,000 Btu, has successfully completed over 100 full charge-discharge cycles. Cycling data show that the rate of heat pumping depends strongly on the absorber-evaporator temperature difference ΔT, ranging from 1.15 moles CH_3OH per mole $CaCl_2$ per hour at $\Delta T = 40°C$ to 0.094 M/M/hr at $\Delta T = 55°C$. These rates are more than adequate for solar heating or for solar cooling using dry ambient air heat rejection. Performance degradation after 100 cycles, expressed as a contact resistance, was less than 2°C, and it appears that the resistance will not be increased by further cycling. The heat exchangers showed some warpage due to plastic flow of the salt, producing the contact resistance, but additional stiffening should prove adequate to guarantee a cycle life >20 years. The experimental COP for cooling was 0.52, close to the theoretically predicted value. (In an optimized system, the cooling COP should be >0.55.) An economic analysis for Washington, D.C. shows that, by the three standard economic decision criteria (payback period, years to recovery of down payment, and years to net positive cash flow), the $CaCl_2$-CH_3OH heat pump should be cost competitive with conventional heating (gas) and cooling (electric) alternatives. Furthermore, because the system is solar driven, absolute fuel savings will exceed other (non-conventional) alternatives.

27037 **(CONF-801264—1) Solar-enhanced coal gasification using high-temperature solar energy.** Lakshmanan, S.; Manasse, F.K.; Mathur, V.K. (New Hampshire Univ., Durham (USA). Dept. of Chemical Engineering). 1980. Contract AC02-79ET21067. 21p. NTIS, PC A02/MF A01. Order Number DE81025020.

From National Solar Energy Convention; Annamalainagar, India (Dec 1980).

In the hybrid solar coal gasification technique, a high temperature solar thermal system will be used to supply the necessary energy to sustain the endothermic reaction and also to produce steam required for the process and the utilities, thereby, eliminating the expensive oxygen plant and conserving non-renewable fossil fuel. Earlier studies have shown the economic feasibility of such a system. Here, a fluidized bed coal gasification system using solar energy for the production of synthesis gas is described. The problems relating to its commercialization are also discussed.

27038 **(CONF-810672—17) Crawl space-assisted heat pumps.** McGill, R.N. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 10p. NTIS, PC A02/MF A01. Order Number DE81023221.

From DOE heat pump contractors' program integration meeting; McLean, VA, USA (2 Jun 1981).

By means of field tests in real houses, it was found that the source air for the heat pump can be preheated (or precooled) by drawing the outdoor air through the crawl space before it is used by the heat pump. The outdoor air is warmed (or cooled) by flowing over the crawl space earth. Most of the data is from winter months, when one would expect the most benefit for heat pump performance. Generally, greater preheating occurs at lower outdoor air temperatures; and, the effect tapers off to virtually no gain at about 10°C. The preheating effect has been shown to be sustained for an entire winter season. Another experiment proved that the preheating does come, in great part, from the earth and not simply from the house above. Analysis has also led us to believe that the heat transfer mechanism is by simple conduction within the upper 0.3 m of the crawl space earth. The current efforts of the project are twofold. First, with three identical houses, leased and unoccupied, compehensive tests of the concept will be carried out to determine the extent to which the efficiency of a heat pump might be improved by this method. Secondly, computer modeling efforts are underway to describe the crawl space earth and air behavior. Mating of this model, after it is validated, with existing heat

pump models should allow us the prediction of the extent of benefits that might be attained in different climates.

27039 **(COO—2577-20) Performance of evacuated tubular solar collectors in a residential heating and cooling system. Final report, 1 October 1978-30 September 1979.** Duff, W.S.; Loef, G.O.G. (Colorado State Univ., Fort Collins (USA). Solar Energy Applications Lab.). Mar 1981. Contract AS02-76CS32577. 196p. NTIS, PC A09/MF A01.

Operation of CSU Solar House I during the heating season of 1978-1979 and during the 1979 cooling season was based on the use of systems comprising an experimental evacuated tubular solar collector, a non-freezing aqueous collection medium, heat exchange to an insulated conventional vertical cylindrical storage tank and to a built-up rectangular insulated storage tank, heating of circulating air by solar heated water and by electric auxiliary in an off-peak heat storage unit, space cooling by lithium bromide absorption chiller, and service water heating by solar exchange and electric auxiliary. Automatic system control and automatic data acquisition and computation are provided. This system is compared with others evaluated in CSU Solar Houses I, II and III, and with computer predictions based on mathematical models. Of the 69,513 MJ total energy requirement for space heating and hot water during a record cold winter, solar provided 33,281 MJ equivalent to 48 percent. Thirty percent of the incident solar energy was collected and 29 percent was delivered and used for heating and hot water. Of 33,320 MJ required for cooling and hot water during the summer, 79 percent or 26,202 MJ were supplied by solar. Thirty-five percent of the incident solar energy was collected and 26 percent was used for hot water and cooling in the summer. Although not as efficient as the Corning evacuated tube collector previously used, the Philips experimental collector provides solar heating and cooling with minimum operational problems. Improved performance, particularly for cooling, resulted from the use of a very well-insulated heat storage tank. Day time (on-peak) electric auxiliary heating was completely avoided by use of off-peak electric heat storage. A well-designed and operated solar heating and cooling system provided 56 percent of the total energy requirements for heating, cooling, and hot water.

27040 (DOE/BP—38, pp 77-81) **Views on the commercial readiness of some solar technologies.** Aitken, D.W. (Western SUN, Portland, OR). 1980. NTIS, PC A07/MF A01.

From 2. annual Pacific Northwest alternative and renewable energy resources conference; Portland, OR, USA (27 Oct 1980).

The following technologies are reviewed: wind-electric, solar space heating and daylighting, and photovoltaics. (MHR)

27041 **(DOE/CS/30149—T1) Report on the solar assessment of non-federal public buildings in the Northeast Region. Final report.** Pansey, A.W. (Northeast Solar Energy Center, Cambridge, MA (USA)). Feb 1980. Contract AC02-80CS30149. 23p. NTIS, PC A02/MF A01. Order Number DE81025965.

The activities and results of the Non-Federal Public Buildings Assessment project are summarized. The purpose of the project was to stimulate and assist the states of the Northeast Region in planning for the conversion of non-federal (state, county and municipal) public buildings from conventional energy to solar. These buildings include office buildings, schools, universities, hospitals, courthouses, prisons, police and fire stations, city and town halls, animal pounds, fish hatcheries, game farms and agricultural facilities. All are major users of energy, most of it in the form of distillate or residual oil. The thrust of the project was solely on domestic hot water and space heating applications, with energy provided by active or passive solar thermal, wood, and, possibly, wind.

27042 **(DOE/CS/30248—T1) Thermal storage studies for solar heating and cooling: applications using chemical heat pumps. Final report, September 15, 1979-April 15, 1980.** Offenhartz, P.O.D. (EIC Labs., Inc., Newton, MA (USA)). Apr 1981. Contract AC02-79CS30248. 134p. NTIS, PC A07/MF A01.

TRNSYS-compatible subroutines for the simulation of chemical heat pumps have been written, and simulations (including heating, cooling, and domestic hot water) have been performed for Washington, DC and Ft. Worth, Texas. Direct weekly comparisons of the H_2SO_4/H_2O and $CaCl_2/CH_3OH$ cycles have been carried out. Projected performance of the NH_4NO_3/NH_3 cycle has also been investigated, and found to be essentially identical to H_2SO_4/H_2O. In all cases simulated, the solar collector is a fixed evacuated tube system, which is necessary because chemical heat pumps operate at higher solar collector temperatures (> 100°C) than conventional solar systems. With standard residential loads, the chemical heat pumps performed surprisingly well. In the Ft. Worth climate, less than 45 m^2 of collectors were required to meet over 90% of the heating and cooling loads. In Washington, DC, the area required to meet the cooling load was smaller (as little as 20 m^2, depending on window shading), but was sufficient to meet only 50 to 60% of the heating load. However, gas-fired backup via the heat pump was quite effective in reducing fossil fuel consumption: the thermal COPs in the heating mode were in the range 1.6 to 1.7. Since chemical heat pumps are designed to reject heat at relatively high temperatures, they were also effective in providing domestic hot water, supplying ca. 70% of the DHW in summer, ca. 50% in winter, and nearly 100% in spring and fall.

27043 **(DOE/CS/30579—T1) Final draft: IEA Task 1. Report on Subtask D, optimization of solar heating and cooling systems.** Freeman, T.L. (ed.). (Altas Corp., Santa Cruz, CA (USA)). Mar 1981. Contract AC03-80CS30579. 55p. NTIS, PC A04/MF A01.

A review of general techniques and specific methods useful in the optimization of solar heating and cooling systems is undertaken. A discussion of the state-of-the-art and the principal problems in both the simplified thermal performance analysis and economic analysis portions of the optimization problem are presented. Sample economic analyses are performed using several widely used economic criteria. The predicted thermal results of one typical, widely used simplified method is compared to detailed simulation results. A methodology for and the results of a sensitivity study of key economic parameters in the life cycle cost method are presented. Finally, a simple graphical optimization technique based on the life cycle cost method is proposed.

27044 **(DOE/CS/31590—) Development of a high temperature solar powered water chiller. Phase III technical progress report, April 1, 1979-September 30, 1979.** English, R.A. (Carrier Corp., Syracuse, NY (USA). Energy Systems Div.). Nov 1979. Contract AC03-77CS31590. 104p. NTIS, PC A06/MF A01. Order Number DE81023558.

This project is to design, construct, and test a 25 ton air cooled water chiller for multi-family and commercial applications. The design utilizes a dual loop Rankine power cycle driving a Rankine vapor compression cycle. The prime mover, a high speed turbo machine with a variable speed electric auxiliary energy source, is being designed and built under subcontract by Mechanical Technology, Inc. During this period, materials, components, and subassemblies were procured and fabrication of the chiller has been nearly completed. The turbo machine assembly has not been started. A boiler feed pump has been developed and tested satisfactorily. All instrumentation and test equipment has been selected and ordered, and the test facility is under construction.

27045 **(DOE/CS/34702—T1) Thin-film optical shutter. Final report.** Matlow, S.L. (Southwall Corp., Palo Alto, CA (USA)). Feb 1981. Contract AC02-78CS34702. 196p. NTIS, PC A09/MF A01.

A specific embodiment of macroconjugated macromolecules, the poly (p-phenylene)'s, has been chosen as the one most likely to meet all of the requirements of the Thin Film Optical Shutter project (TFOS). The reason for this choice is included. In order to be able to make meaningful calculations of the thermodynamic and optical properties of the poly (p-phenylene)'s a new quantum mechanical method was developed - Equilibrium Bond Length (EBL) Theory. Some results of EBL Theory are included.

27046 **(DOE/NASA/CR—161763) Solar space heating installed at Kansas City, Kansas. Final report.** (Ducat Investments, Inc., Kansas City, KS (USA)). May 1981. Contract AI01-76CS31024. 135p. NTIS, PC A07/MF A01. Order Number DE81025495.

The solar energy system was constructed with the new 48,800 square feet warehouse to heat the warehouse area of about 39,000 square feet while the auxiliary energy system heats the office area of about 9800 square feet. The building is divided into 20 equal units, and each has its own solar system. The modular design permits the flexibility of combining multiple units to form offices or warehouses of various size floor areas as required by a tenant. Each unit has 20 collectors which are mounted in a single row. The collectors, manufactured by Solaron Corporation, are double glazed flat plate collectors with a gross area of 7800 ft^2. Air is heated either through the collectors or by the electric resistance duct coils. No freeze protection or storage is required for this system. Extracts from the site files, specifications, drawings, installation, operation and maintenance instructions are included.

27047 (SERI/CP—761-1077(Vol.2), pp 21-40) **Desalination by reverse osmosis.** Bushnak, A.A. (Univ. of Riyadh, Saudi Arabia). Mar 1981. NTIS, PC A07/MF A01.

From Solar desalination workshop; Denver, CO, USA (23 Mar 1981).

The state-of-the-art of desalination by reverse osmosis, RO, membranes is presented with an emphasis on energy requirements. The basic principles of RO and the factors affecting membrane and plant performance are reviewed. The maximum feasible recovery for seawater conditions prevailing in Saudi Arabia is presented. The energy requirements for RO plants desalting sea water of the Red Sea at different recovery ratios and operating pressures are calculated and the impact of energy recovery is indicated. The paper has two basic conclusions concerning the reverse osmosis desalination process: (1) it has great potential for solar energy utilization because of its energy efficiency; (2) it is highly adaptable to the needs of developing countries for both brackish water and seawater desalination. Solar energy can be used for the energy source by: (1) photovoltaic cells or (2) making use of a thermodynamic cycle. 15 references.

27048 (SERI/CP—761-1077(Vol.2), pp 55-69) **Planning an energy efficient solar powered desalination plant.** Nadler, M.; Moreno, A. Jr. (Exxon Enterprises, Florham Park, NJ). Mar 1981. NTIS, PC A07/MF A01.

From Solar desalination workshop; Denver, CO, USA (23 Mar 1981).

The preliminary design for a 6000 m^3/d totally solar, thermal powered seawater desalination plant is described. The solar energy collection subsystem consists of a heliostat (396 heliostats, each with a reflective area of 57.6 m^2)/central receiver field; the energy storage subsystem is molten salt thermal storage, allowing the plant to operate 24 hours/day. The energy delivery subsystem is a steam boiler and a steam turbine driven generator. The desalination subsystem is a hybrid design employing two parallel operating sections: (1) a multiple effect distillation unit and (2) a reverse osmosis unit. (MJJ)

27049 (SERI/CP—761-1077(Vol.2), pp 89-93) **Solar distillation units: another approach.** Bastos-Netto, D.; Zettl, B.J.E. (Brazilian Naval Research Inst., Rio de Janeiro). Mar 1981. NTIS, PC A07/MF A01.

From Solar desalination workshop; Denver, CO, USA (23 Mar 1981).

Previous work on solar stills is reviewed. The classic solar still is described, as well as recent work on flat plate collectors. A new solar still has been especially designed for the National Alcohol Program in Brazil. It consists of (1) a distillation dome unit and (2) a conventional flat-plate solar heater or pond. A simplified analysis is carried out on the performance of this new system, both for the collector and the dome. Four distinct stills are proposed: (1) dome is air-colled; (2) dome is water-cooled; (3) thermosyphoning between dome and flat-plate solar heater; and (4) with pre-heating of water. 9 references. (MJJ)

27050 (SERI/CP—761-1077(Vol.2), pp 115-117) **Solar desalting planning in California.** Brice, D.B. (Dept. of Water Resources, Sacramento, CA). Mar 1981. NTIS, PC A07/MF A01.

From Solar desalination workshop; Denver, CO, USA (23 Mar 1981).

Our current development program, the California Department of Water Resources involves the desalting of brackish agricultural drainage water. Design of a reverse osmosis demonstration desalter for agricultural drainage water is presently under way. It is expected that solar salt gradient ponds will be used to provide some of the energy for the demonstration desalter utilizing the brine produced from the desalting process in the solar salt ponds. A brief discussion and a schematic process flowsheet for the various processes are presented.

27051 (SERI/CP—761-1077(Vol.2), pp 119-125) **Solar desalination: the Philippine experience.** Inductivo, C.; Santos, A.C. (Center for Nonconventional Energy Development, Quezon City, Philippines). Mar 1981. NTIS, PC A07/MF A01.

From Solar desalination workshop; Denver, CO, USA (23 Mar 1981).

In a remote Philippine island of 1,616 hectare area off Batangas City, inhabited by 7,513 (1975) people, an integrated energy system harnessing two of the world's oldest nonconventional energy resources - the sun and the wind - has been developed. In view of the acute shortage of drinking water that the island has been experiencing, solar stills that produce drinking water, with salt as the by-product (through salt making-bed) have been installed. The windmill pumps sea water to the solar stills. To maximize production of fresh water, the stills were also designed to serve as a rain catching basin. The stills consisting of 9 modular units with a total area of 4,795.2 sq. ft. were designed to produce an average of 450 gallons of distilled water per day. Measured outputs, however, were approximately 130 gallons per day. This low ouput was attributed to the excessive heat loss in the walls, insufficient sealing of the glass roofings and the quick deterioration of the absorber coating.

27052 (SERI/CP—761-1077(Vol.2), pp 127-132) **Use of the wiped-film rotating-disk evaporator in solar-powered distillation.** Tleimat, B.W. (Univ. of California, Berkeley). Mar 1981. NTIS, PC A07/MF A01.

From Solar desalination workshop; Denver, CO, USA (23 Mar 1981).

This is a brief review of solar distilation research at the Sea Water Conversion Laboratory. The development of the high performance wiped-film rotating-disk evaporator and its possible application to solar-powered multieffect distillation is also reviewed. Performance data with deionized water and seawater feed are given and show that overall heat-transfer coefficients as high as 50 kWm^{-2}C^{-1} are possible. Predictions of water cost from solar-powered multieffect distillation as well as productivity per unit area of solar collectors are also given. The predictions show that productivity up to 130 liters m^{-2}day^{-1} is possible for brackish water feed with 60°C steam from the solar boiler. 8 references.

27053 (SERI/CP—761-1077(Vol.2), pp 133-137) **Experience gained in solar desalination.** Fernandez, A. Mar 1981. NTIS, PC A07/MF A01.

From Solar desalination workshop; Denver, CO, USA (23 Mar 1981).

A brief description is given of two desalination projects sponsored jointly by Mexico and the Federal Republic of Germany. The first involves the planning, design, construction, and evaluation of a multstage flash seawater desalination plant (SMSF-DIGAASES-DORNIER), which uses flat-plate collectors and parabolic concentrators. The second involves planning, design, construction, mounting and evaluation of a desalination plant for brackish water (SORO), using the reverse osmosis process and photovoltaic arrays to provide the necessary electricity for the plant's operation.

27054 (SERI/CP—761-1077(Vol.2), pp 139-142) **Solar desalination research at the University of Arizona.** Groh, J.E. (Tucson International Airport, AR). Mar 1981. NTIS, PC A07/MF A01.

From Solar desalination workshop; Denver, CO, USA (23 Mar 1981).

Solar distillation research at the University of Arizona during the 1960's was primarily concerned with the development of a multiple-effect still which used separate components for energy

collection, evaporation and condensation. A pilot plant constructed on the Gulf of California produced approximately 19 M^3 (5,000 gal) per day of freshwater from 970 M^2 (10400 ft^2) of solar collector area. Further development of the process was impeded primarily by the lack of a satisfactory plastic film for the solar collectors. Research was very limited during the 1970's; however, a basin-type (greenhouse) still was designed for the government of Venezuela, which constructed a 4.7 M^3 (1500 gal) per day unit on La Orchila Island in the Caribbean Sea.

27055 **(SERI/TR—731-1036) Application of solar ponds to district heating and cooling.** Leboeuf, C.M. (Solar Energy Research Inst., Golden, CO (USA)). Apr 1981. Contract AC02-77CH00178. 41p. NTIS, PC A03/MF A01. Order Number DE81026557.

A preliminary investigation is reported of the feasibility of incorporating solar ponds into new subdivisions to provide district heating, domestic hot water (DHW), and district cooling. Two locations were chosen for analysis: Fort Worth, Texas and Washington, DC. Solar ponds were sized to meet space heating, cooling, and DHW loads in each location for differing community sizes. Parameters such as storage layer temperature, pond geometry, and storage depth vs surface area were varied to determine the most effective approach to solar pond utilization. A distribution system for the district heating system was designed, including sizing of heat exchangers, piping, and pumps. Cost estimates for the pond and distribution system were formulated by using data generated in pond sizing, as well as associated system costs (e.g., salt costs and distribution system costs). Finally, solar ponds were found to be competitive with residential flat-plate collector systems, with delivered energy costs as low as $16.00/GJ.

27056 **(SOLAR/1004—81/50) Solar project description for John Byram, Jr. single-family residence; Shawnee Mission, Kansas.** (Department of Housing and Urban Development, Washington, DC (USA); Boeing Co., Seattle, WA (USA)). 2 Jul 1981. Contract AB01-76CS31020. 67p. NTIS, PC A04/MF A01. Order Number DE81025175.

The active solar heating system utilized for space heat and domestic hot water includes 312 square feet of roof-mounted flat plate air collectors and 172-cubic feet pebble bed heat storage unit. A gas-fired furnace is used for auxiliary space heating and a gas fired domestic water heater is used for hot water. A passive system consisting of an attached greenhouse and a Trombe wall is also included. The collectors, storage, energy-to-load, and auxiliary subsystems are described. Specific details of the operating modes and controls are also given.

27057 **(SOLAR/1048—81/50) Solar project description for Hyde Brothers Building Company, Inc. single-family dwelling, Clarksdale, Mississippi.** (Department of Housing and Urban Development, Washington, DC (USA); Boeing Co., Seattle, WA (USA)). 2 Jul 1981. Contract AB01-76CS31020. 57p. NTIS, PC A04/MF A01.

The Hyde Brothers site is a 1670 square foot, single-family residence in Clarksdale, Mississippi. Its air-medium space heating and domestic hot water system has a 16-panel flatplate collector array with a gross area of 312 square feet. Energy is stored in a wood and concrete rock bin with a volume of 230 ft^3, containing about 19,000 pounds of smooth stones. The auxiliary for space heating is an air-to-air heat pump, a recirculation fire place and a resistant heater unit. Domestic hot water is preheated and stored in an 82-gallon tank for delivery to a 52-gallon DHW tank. Heated air passing through an air-to-liquid heat exchanger provides the energy for pre-heating domestic hot water (DHW) which is provided by circulating water from a storage tank through the air-to-liquid heat exchanger.

27058 **(SOLAR/1055—81/50) Solar project description for Loyola University-Biever Hall men's dormitory, New Orleans, Louisiana.** (Department of Housing and Urban Development, Washington, DC (USA); Boeing Co., Seattle, WA (USA)). 10 Jul 1981. Contract AB01-76CS31020. 50p. NTIS, PC A03/MF A01. Order Number DE81026597.

The Loyola University solar energy system, located in New Orleans, Louisiana, preheats approximately 9000 gallons of domestic hot water (DHW) each day to Biever Hall Dormitory. Biever Hall is a six-story dormitory that houses 420 students. The system is designed to supply 140°F water to bathrooms, showers, and eight washing machines. The solar energy system has 15 arrays of flat-plate collectors with a gross area of 4590 square feet. The system is an open loop system which uses potable water as both the collector fluid and storage medium. City water is preheated by flat plate collectors on the roof and stored in a 5000 gallon tank located on the west side of the building at ground level. Upon demand the preheated water is transported to two existing 1500 gallon hot water tanks. Auxiliary energy is supplied by a central heating plant via a high temperature/high pressure line.

27059 **(SOLAR/1087—81-50) Solar project description for Ortiz and Reill Developers, Inc., (Lot 8) single family residence, Escondido, California.** (Department of Housing and Urban Development, Washington, DC (USA); Boeing Co., Seattle, WA (USA)). 18 Jun 1981. Contract AB01-76CS31020. 64p. NTIS, PC A04/MF A01.

An instrumented single-family residence in Escondido, California, has approximately 1536 square feet of conditioned space. The domestic-hot-water (DHW) heating and space heating system has an array of flat-plate collectors with a gross area of 222 square feet. Solar energy is stored in a 750-gallon tank located in the ground floor utility room. Heated city water is stored in a 66-gallon DHW tank. A gas furnace provides auxiliary energy for the space heating system. An electrical heating element in the DHW tank provides auxiliary energy for DHW heating. Energy from a hydronic fireplace radiates directly into the living space and supplements solar modes 1 and 2. The fireplace-to-storage mode activates if the fireplace is being used and the temperature difference between its water plenum and storage output is more than 9°F. During operation, water is circulated from storage through the fireplace heat exchanger. Original cost estimates are included.

27060 **Passive solar systems.** Balcomb, J.D. pp 147-172 of Economics of solar energy and conservation systems. Volume II. Solar applications and cost. Kreith, F.; West, R.E. (eds.). Boca Raton, FL; CRC Press, Inc. (1980).

A passive solar system is defined and distinguished from energy conservation by architectural design. Key economic elements - net energy savings and cost over and above normal construction - are considered. Passive solar designs are categorized in one of two ways, by physical category or by generic category. Examples of each class of category are described and discussed. The dependence of performance predictions on climate, system design and system type is discussed. The costs added on to those of ordinary construction considered. Economic considerations are discussed, including the cost/benefit ratio, tax implications, operation and maintenance, resale value, regional variations in building practices, retofitting, and use of off-peak utility energy. (LEW)

1410 Solar Collectors And Concentrators

27061 **(SAND—80-7076) Full scale load tests of experimental solar collector foundations.** Merkle, D.H. (Sandia National Labs., Albuquerque, NM (USA); Applied Research Associates, Inc., Albuquerque, NM (USA)). Jun 1981. Contract AC04-76DP00789. 114p. (CONF-810341—1). NTIS, PC A06/MF A01. Order Number DE81026044.

From ASCE spring conference; Las Cruces, NM, USA (27 Mar 1981).

Four drilled, reinforced concrete piers, typical of foundations utilized for single-axis-tracking solar collector systems, were tested to failure under both eccentric lateral and vertical loads. Previously developed equations for lateral and vertical load capacity yielded reasonable predictions, but the tests disclosed the need to improve the foundation anchor bolt assembly, and possibly also the method of mounting the collectors to the foundations. Nevertheless, the lateral and vertical failure loads and moments of all four piers well exceeded specified design values.

1420 Heat Storage

REFER ALSO TO CITATION(S) 27014, 27036, 27189, 27207

27062 (CONF-801055—, pp 47-49) **Overview of the SERI solar energy storage program.** Wyman, C.E. (Solar Energy Research Inst., Golden, CO). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The SERI Solar Energy Storage Program is summarized. The program provides research, systems analyses, and assessments of thermal energy storage and transport in support of the Thermal and Chemical Energy Storage Program of the DOE Division of Thermal and Mechanical Energy Storage Systems. Currently, research is in progress on direct contact thermal energy storage and thermochemical energy storage and transport. In addition, activities are being initiated in the definition of new thermal energy storage concepts and thermal energy transport by sensible and latent heat media. Systems analyses are performed of thermal energy storage for solar thermal applications, and surveys and assessments are used to coordinate thermal energy storage activities for solar applications, particularly in building heating and cooling.

27063 (CONF-801055—, pp 58-59) **Cost and performance of thermal storage concepts in solar thermal systems.** McKenzie, A.W. (Stearns-Roger Services Inc., Denver, CO). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The objectives of this study are as follows: to provide consistently calculated cost data, to develop realistic performance data, and to project that data for a mature technology for several thermal storage concepts integrated into several solar thermal systems. Available thermal storage concepts were reviewed through a literature search, and contacts with the Solar Energy Research Institute, National Laboratories, and other contractors. A screening criteria were developed which, when applied, resulted in forty systems being judged suitable for further study. Schematics were made for these systems, quantities were established, and from these rough-order-of-magnitude costs determined. Based upon the foregoing, candidate systems were further reduced. The remaining twenty systems were more fully developed.

27064 (CONF-801055—, pp 60-64) **High-temperature molten salt thermal energy storage systems for solar applications.** Petri, R.J.; Claar, T.D. (Inst. of Gas Tech., Chicago, IL). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The overall objective of this program is to select and test latent-heat alkali and alkaline earth carbonate storage salts, containment materials, and thermal conductivity enhancement (TCE) materials for use in high-temperature (704° to 871°C, 1300° to 1600°F) thermal energy storage systems utilizing advanced solar-thermal power generation concepts. This will be accomplished by screening candidate salt/containment/TCE materials combinations in 1000 (tests completed) and 3000 hour capsule compatibility tests employing both reagent- and technical-grade (low cost) salts. The results of these compatibility tests will lead to the selection of the materials combinations that best meet the anticipated solar power system requirements. Needs for more reliable thermophysical and transport property data will be identified and measurements will then be performed on these salts to support the scale-up of solar-thermal TES subsystems.

27065 (CONF-801055—, pp 89-94) **Molten nitrate salt materials studies.** Carling, R.W. (Sandia National Labs., Livermore, CA). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

An overview is presented of the experimental programs underway in support of the Thermal Energy Storage for Solar Thermal Applications (TESSTA) program. The experimental programs are concentrating on molten nitrate salts which have been proposed as heat transfer and energy storage medium. The experimental programs involve corrosion, decomposition, physical properties, and environmental cracking. Summaries of each project and how they impact central receiver applications are presented.

27066 (CONF-801055—, pp 113-117) **Dish-mounted latent heat buffer storage.** Manvi, R. (California Inst. of Tech., Pasadena). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

Since thermal buffer storage can improve upon system performance of a parabolic dish solar thermal power plant, a task is being conducted in support of the Thermal Energy Storage for Solar Thermal Applications Program (TESSTA). The objective of this task is to develop appropriate dish-mounted latent heat storage subsystems for Rankine, Brayton, and Stirling engines operating at 427°C, 816°C, and 816°C, respectively. This paper describes the effort completed during FY 1980 concerning storage requirements definition, conceptual design, media stability and compatibility tests, and thermal performance analyses.

27067 (CONF-801055—, pp 118-122) **Storage requirements definition and SRE design for dish Stirling systems.** Zimmerman, W.F.; Stacy, L.E.; Wesling, G.C. (General Electric Co., Evendale, OH). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

A direct dish Stirling solar receiver (DSSR) and a heat pipe solar receiver (HPSR) with TES are described for which the cost effectiveness and thermal performance are being analyzed, minute by minute, over one year of solar insolation. Using existing designs of these two receivers, parametric performance and cost studies are underway to determine the influences of adding varying amounts of TES to the DSSR and of providing fossil fuel combustion and of varying the levels of TES in the HPSR. The thermal modeling of the two receivers has been completed and the criteria and programming for the economic analysis have been documented. After completing the parametric analysis, alternative design concepts for TES in both systems will be developed, subscale research experiments (SRE) will be suggested, TES development needs will be identified and recommendations will be made for future experimental and analytical efforts.

27068 (CONF-801055—, pp 123-128) **Thermal energy buffer storage for the small community solar thermal power experiment.** Polzien, R.E. (Ford Aerospace and Communications Corp., Newport Beach, CA). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The preliminary results are reported of a study carried out for the application of a latent heat Thermal Energy Buffer Storage (TEBS) Subsystem to the Small Community Solar Thermal Power Experiment (SCSE). The SCSE is a 1-MWe solar thermal electric power generation system currently under development; it consists of multiple Point Focusing Distributed Receiver power modules equipped with an organic Rankine cycle power conversion unit mounted at the focus of each paraboloidal concentrator. Objective of the TEBS is to minimize plant shutdowns during intermittent cloud coverages, thereby improving life expectancy of the major subsystems with attendant reduction in capital investment and maintenance costs. An SCSE plant performance model modified for operation with a TEBS system is used with time-varying insolation to show that 70 to 80 percent of the potential engine shutdowns due to insolation dropout may be averted with the TEBS System. Optimum TEBS capacities and charge/discharge rate capabilities are being identified for this application. Results of preliminary design analyses of various TEBS concepts are discussed. The TEBS concept with best potential for the SCSE application is a separately packaged phase change material storage system with active fluid controls to regulate the charge and discharge rates.

27069 **(SAND—81-8007) Chemistry of the binary $NaNO_3$-KNO_3 system.** Nissen, D.A. (Sandia National Labs., Livermore, CA (USA)). Jun 1981. Contract AC04-76DP00789. 26p. NTIS, PC A03/MF A01. Order Number DE81026585.

By chemical analysis of samples taken under carefully controlled conditions, it was shown that the only reaction of any consequence that takes place in the equimolar binary $NaNO_3$-KNO_3 system over the temperature range 500 to 600°C is represented by NO_3^- reversible NO_2^- + 1/2(O_2). Over this temperature range there is no evidence of the formation of any anionic oxygen species, such as oxide, peroxide, or superoxide, a concentrations greater than 10^{-6} mole/kg. Equilibrium constants for the above reaction have been determined over the temperature range 500 to 620°C. The standard free energy for this reaction (ΔG^0 = -23,029 + 20.64T) has been derived from the experimental data and is in good agreement with similar data for the single salts.

15 GEOTHERMAL ENERGY

REFER ALSO TO CITATION(S) 27252

1501 Resource Status And Assessment

27070 (DOE/ET/27085—1(Add.), pp 21-42) **Gulf Coast geopressured-geothermal resources as related to hydrogeologic characteristics of the subsurface system for disposal of spent brines.** Wallace, R.H. Jr. (Geological Survey, NSTL Station, MS). 1979. NTIS, PC A09/MF A01.

From Workshop on subsurface disposal of geopressured fluids; Baton Rouge, LA, USA (6 Mar 1979).

Some of the uses of existing information in describing the subsurface system are shown and some of the considerations that must be taken into account in disposal of spent geopressured-geothermal brines are indicated. The goepressured resources of the Gulf Coast are assessed and information needs are indicated. (MHR)

1503 Geothermal Exploration And Exploration Technology

27071 **(LA—8751-HDR) Hot dry rock geothermal potential of Roosevelt Hot Springs area: review of data and recommendations.** East, J. (Los Alamos National Lab., NM (USA)). May 1981. Contract W-7405-ENG-36. 46p. NTIS, PC A03/MF A01. Order Number DE81026668.

The Roosevelt Hot Springs area in west-central Utah possesses several features indicating potential for hot dry rock (HDR) geothermal development. The area is characterized by extensional tectonics and a high regional heat flow of greater than 105 mW/m^2. The presence of silicic volcanic rocks as young as 0.5 to 0.8 Myr and totaling 14 km^3 in volume indicates underlying magma reservoirs may be the heat source for the thermal anomaly. Several hot dry wells have been drilled on the periphery of the geothermal field. Information obtained on three of these deep wells shows that they have thermal gradients of 55 to 60°C/km and bottom in impermeable Tertiary granitic and Precambrian gneissic units. The Tertiary granite is the preferred HDR reservoir rock because Precambrian gneissic rocks possess a well-developed banded foliation, making fracture control over the reservoir more difficult. Based on a fairly conservative estimate of 160 km^2 for the thermal anomaly present at Roosevelt Hot Springs, the area designated favorable for HDR geothermal exploration may be on the order of seven times or more than the hydrogeothermal area currently under development.

27072 **US energy supplies and the outlook for geothermal resources in Nebraska.** Gosnold, W.D. Jr. (Univ. of Nebraska, Omaha). pp 24p, Paper 6 of Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

Work done in exploring for geothermal resources in Nebraska is summarized in this paper. The resource assessment includes the compilation of existing data, analysis of bottom hole temperatures logged in exploration wells, and surface heat flow measurements. The production of a user-oriented geothermal resource map is the goal of the program. The possibility of tying the geothermal resource to ethanol production is suggested. (DMC)

1504 Legal And Institutional Aspects

REFER ALSO TO CITATION(S) 27078

27073 (DOE/ET/27085—1(Add.), pp 3-5) **Texas regulatory framework.** Singletary, G. (Railroad Commission of Texas, Austin). 1979. NTIS, PC A09/MF A01.

From Workshop on subsurface disposal of geopressured fluids; Baton Rouge, LA, USA (6 Mar 1979).

The Texas Railroad Commission is the regulatory authority for oil and gas and geothermal operations in Texas. Commission policies on waste water disposal are discussed briefly. (MHR)

27074 (DOE/ET/27085—1(Add.), pp 7-10) **Louisiana regulatory framework.** Deville, W. (Louisiana Dept. of Natural Resources, Baton Rouge). 1979. NTIS, PC A09/MF A01.

From Workshop on subsurface disposal of geopressured fluids; Baton Rouge, LA, USA (6 Mar 1979).

Louisiana's regulatory framework for disposal of geopressured fluids is handled by the Office of Conservation. State and national regulations are reviewed briefly. (MHR)

27075 (DOE/ET/27085—1(Add.), pp 11-14) **Federal regulatory framework.** Browing, L. (Environmental Protection Agency, Dallas, TX). 1979. NTIS, PC A09/MF A01.

From Workshop on subsurface disposal of geopressured fluids; Baton Rouge, LA, USA (6 Mar 1979).

Federal regulations relating to underground injection that are still in the proposed state are discussed. Regulations mandated in the Safe Drinking Water Act, the Resource Conservation and Recovery Act of 1974, and the Executive Order for the Protection of the Wetlands are mentioned.

27076 **(EMD—81-39) Impact of geothermal development on stockraising homestead landowners.** (General Accounting Office, Washington, DC (USA)). 16 Apr 1981. 64p. General Accounting Office, Gaithersburg, MD. Order Number DE81903691.

Report to the Committee on Interior and Insular Affairs, House of Representatives, by the Comptroller General of the United States.

Surface use and compensation conflicts have developed at the Geysers in California between owners of surface lands acquired under the Stockraising Homestead Act of 1916 and geothermal lessees with the right to develop the mineral interests reserved to the Federal Government. Several recommendations are made to the Secretary of the Interior concerning the problems identified. The following are discussed: conditions at the Geysers concerning geothermal development on stockraising lands that could be considered in regard to compensation, existence or potential for similar conflicts on this land outside the Geysers, protection and compensation provided surface owners in existence of legislation and the need for amendments, and alternative methods for paying compensation.

1505 Economic And Financial Aspects

REFER ALSO TO CITATION(S) 27085

27077 **(DOE/NV/10089—1) Economic analysis of geopressured resources: site specific consideration of geopressured methane gas at Brazoria. Final report, 1 March 1980-28 February 1981.** (Pennsylvania Univ., Philadelphia (USA). School of Public and Urban Policy). Apr 1981. Contract AS08-80NV10089. 98p. NTIS, PC A05/MF A01. Order Number DE81027193.

The current project is aimed first at narrowing the range of uncertainties in economic information of geopressured resource in light of the recently collected data on the Brazoria Fairway. Secondly, the project has developed a basic analytical framework for determining the investment potential of the geopressured resource at Brazoria. Thirdly, the project quantitatively evaluates the relative effectiveness of a number of financial incentives and other public policy initiatives designed to accelerate the commercialization of geopressured resources. Final results of this project are re-

ported including: (1) a review of current estimates of important resource parameters at the Austin Bayou Project, (2) initial cash flow simulations of development of the Austin Bayou Prospect, (3) sensitivity analysis of these simulations and evaluation of the uncertainties' impact on measures of profitability and investment decision analysis, and (4) a brief review of the well-testing program.

1506 Environmental Aspects And Waste Disposal

REFER ALSO TO CITATION(S) 26839, 27070, 27073, 27074, 27681, 27812

27078 (DOE/ET/27085—1(Add.)) **Workshop on subsurface disposal of geopressured fluids, Gulf Coast: proceedings.** Bachman, A.L. (ed.). (Louisiana Dept. of Natural Resources, Baton Rouge (USA); Louisiana State Univ., Baton Rouge (USA)). 1979. Contract FG08-78ET27085. 183p. (CONF-7903148—). NTIS, PC A09/MF A01.

From Workshop on subsurface disposal of geopressured fluids; Baton Rouge, LA, USA (6 Mar 1979).

Twelve papers are included. A separate abstract was prepared for each one. Also included in the proceedings are discussion summaries. Louisiana regulations on disposal of geopressured fluids are appended. (MHR)

27079 (DOE/ET/27085—1(Add.), pp 15-18) **Geopressured resource development scenarios.** Smith, C.G. (Consulting Geologist, Baton, Rouge, LA). 1979. NTIS, PC A09/MF A01.

From Workshop on subsurface disposal of geopressured fluids; Baton Rouge, LA, USA (6 Mar 1979).

Problems likely to be associated with the disposal of water from geopressured systems by reinjection are discussed. (MHR)

27080 (DOE/ET/27085—1(Add.), pp 71-76) **Programmatic aspects of strategic petroleum reserve deep well injection.** Smith, R.E. (Dept. of Energy, Washington, DC). 1979. NTIS, PC A09/MF A01.

From Workshop on subsurface disposal of geopressured fluids; Baton Rouge, LA, USA (6 Mar 1979).

The Strategic Petroleum Reserve storage of crude oil in existing brine caverns in the Gulf Coast requires the disposal of millions of barrels of concentrated brine. Significant facts and experience from the brine disposal program are reviewed. (MHR)

27081 (DOE/ET/27085—1(Add.), pp 76-87) **Technical aspects of SPR deep-well injection.** Hahn, W.F. (Dept. of Energy, Washington, DC). 1979. NTIS, PC A09/MF A01.

From Workshop on subsurface disposal of geopressured fluids; Baton Rouge, LA, USA (6 Mar 1979).

Subsurface disposal of brines in selected Gulf Coast Miocene sands is technically feasible. With appropriately designed and operated injection systems, rates in excess of 15,000 barrels per day can be achieved and sustained. On the basis of the SPR's experience, the principal difficulties which can be anticipated in high-rate, high-volume injection systems include injection fluid quality; operational, maintenance, and logistical requirements; and costs of associated facilities. Larger injection systems can be expected to experience attendently greater difficulties.

27082 (DOE/ET/27085—1(Add.), pp 97-145) **Subsurface disposal of brines from geopressured reservoirs.** Donaldson, E.C. (Dept. of Energy, Bartlesville, OK). 1979. NTIS, PC A09/MF A01.

From Workshop on subsurface disposal of geopressured fluids; Baton Rouge, LA, USA (6 Mar 1979).

Subsurface disposal problems associated with spent geopressured brines used for electric power generation are presented as a basis for the discussion of major areas of research. As much as 45,000 m^3/d of brine will be required to operate a 25-megawatt powerplant. A battery of wells may be used for disposal, but pressure interference between the wells will develop if the wells are completed in a close pattern. Multiple completions may also be used to reduce the number of wells required. The compatibility of the injected brines with the reservoir and its fluids is an area of limited knowledge. Movement may occur at fault planes, the receiving zone may become undercompacted, and particle transport in friable zones may severely reduce injectivity.

27083 (DOE/ET/27085—1(Add.), pp 155-156) **Fluid migration: the Louisiana experience.** Bates, R. (Louisiana Dept. of Natural Resources, Baton Rouge). 1979. NTIS, PC A09/MF A01.

From Workshop on subsurface disposal of geopressured fluids; Baton Rouge, LA, USA (6 Mar 1979).

Louisiana has approximately 2900 salt water disposal and secondary recovery wells, and 58 active waste disposal wells. The Louisiana Office of Conservation has been keeping records on salt water disposal wells since 1967. A few cases of fluid migration from an injection well to the surface through an abandoned well or other penetration are discussed.

27084 (DOE/ET/27085—1(Add.), pp 157-158) **Fluid migration: the Texas experience.** Singletary, G. (Railroad Commission of Texas, Austin). 1979. NTIS, PC A09/MF A01.

From Workshop on subsurface disposal of geopressured fluids; Baton Rouge, LA, USA (6 Mar 1979).

Texas has 45,000 injection and secondary recovery wells. Experience with these is reviewed briefly.

27085 (DOE/ET/27085—1(Add.), pp 159-162) **Comment: the federal regulatory framework for the fluid migration problem.** Browing, L. (Environmental Protection Agency, Dallas). 1979. NTIS, PC A09/MF A01.

From Workshop on subsurface disposal of geopressured fluids; Baton Rouge, LA, USA (6 Mar 1979).

Some proposed federal regulations are discussed as they relate to leakage through abandoned wells. (MHR)

27086 **Effects of geothermal effluents on aquatic ecosystems.** Cushman, R.M.; Barnes, D.W.; Craig, R.B. (ORNL). *Environment International ;* **4**: No. 3, 209-216(1980).

The use of geothermal energy for electricity generation and other purposes requires the handling and disposal of large volumes of geothermal fluids. These fluids contain such constituents as ammonia, hydrogen sulfide, and numerous trace elements. The leaching of such wastes in aquatic ecosystems may result in chronic effects to aquatic organisms. Some trace elements may accumulate to hazardous levels in these ecosystems.

1508 Geothermal Power Plants

27087 (DOE/ET/28311—T1) **Geothermal commercial power plant study. Monthly progress report, January 29, 1977-February 25, 1977.** (Bechtel Corp., San Francisco, CA (USA)). 15 Apr 1977. Contract AC03-76ET28311. 14p. NTIS, PC A02/MF A01.

Conceptual designs and capital cost estimates were completed for the six different Heber power plants in this study. The six plants involve two types of operating modes, constant geothermal fluid flow rate and constant power output, each for net capacities of 50, 100, and 200 MWe. Conceptual designs were completed for the six plants by modifying and scaling-up the base case design. The capital costs for all six plants were estimated in fourth-quarter 1976 dollars.

1509 Geothermal Engineering

27088 (SAND—81-0973) **Corrosion inhibition by control of gas composition during mist drilling.** Hinkebein, T.E.; Snyder, T.L. (Sandia National Labs., Albuquerque, NM (USA)). May 1981. Contract AC04-76DP00789. 62p. NTIS, PC A04/MF A01. Order Number DE81026960.

Chemical compositional specifications have been generated for inert gases which reduce drill string corrosion when used in conjunction with mist drilling processes. These specifications are based on the assumption that the corrosion rate is dependent on the dissolved gaseous species concentrations. Data taken both from the literature and from a mist drilling field test with nitrogen in Valle Grande, NM, relate corrosion rates to fluid compositions. These solution compositions are then associated with gas phase compositions

using equilibrium data available from the literature and material balances. Two sources of gas were considered: cryogenically purified nitrogen from air and exhaust gas from a diesel engine, which contain (in addition to N_2 and O_2) CO_2, NO/sub x/, SO_2, H_2O, and CO. A maximum concentration of 50 ppM O_2 in the gas phase is recommended to alleviate pitting corrosion.

1510 Direct Energy Utilization

REFER ALSO TO CITATION(S) 27072

1520 Geothermal Data And Theory

27089 **(LA—8851-MS) Chemical-equilibrium calculations for aqueous geothermal brines.** Kerrisk, J.F. (Los Alamos National Lab., NM (USA)). May 1981. Contract W-7405-ENG-36. 22p. NTIS, PC A02/MF A01. Order Number DE81026802.

Results from four chemical-equilibrium computer programs, REDEQL.EPAK, GEOCHEM, WATEQF, and SENECA2, have been compared with experimental solubility data for some simple systems of interest with geothermal brines. Seven test cases involving solubilities of $CaCO_3$, amorphous SiO_2, $CaSO_4$, and $BaSO_4$ at various temperatures from 25 to 300°C and in NaCl or HCl solutions of 0 to 4 molal have been examined. Significant differences between calculated results and experimental data occurred in some cases. These differences were traced to inaccuracies in free-energy or equilibrium-constant data and in activity coefficients used by the programs. Although currently available chemical-equilibrium programs can give reasonable results for these calculations, considerable care must be taken in the selection of free-energy data and methods of calculating activity coefficients.

17 WIND ENERGY

1703 Regulations

27090 **(SERI/TR—778) Utility siting of WECS: a preliminary legal/regulatory assessment.** Noun, R.J.; Lotker, M.; Friesema, H.P. (Solar Energy Research Inst., Golden, CO (USA)). May 1981. Contract AC02-77CH00178. 100p. NTIS, PC A05/MF A01. Order Number DE81025910.

A growing number of electric utilities in the United States are considering using wind energy as a power generation source. Currently, many utilities are investigating potential wind machine sites in their areas. Identifying suitable sites for large wind machine clusters, or wind farms, requires more than finding a location with an adequate wind resource, however. Consideration must also be given to the legal and regulatory questions raised by wind energy system siting. The purpose of this report is to examine the early experiences of several utilities in dealing with the legal and regulatory issues that were raised in the process of siting wind energy installations. The report also makes recommendations as to how utilities can begin to address many of the identified issues.

1704 Economics

REFER ALSO TO CITATION(S) 27094

27091 (SERI/CP—635-1061, pp 103-109) **Diffuser augmented wind turbine (DAWT): a cost-competitive innovative energy conversion system.** Foreman, K.M. (Grumman Aerospace Corp., Bethpage, NY). 1980. NTIS, PC A10/MF A01.

From 2. wind energy innovative systems conference; Colorado Springs, CO, USA (3 Dec 1980).

This paper reports on work conducted under SERI contract XH-9-8073-1 to explore system engineering design alternatives and to determine cost and energy output of cost effective DAWTs. For each of the three DAWT sizes, three materials of construction approaches were taken within the scope of a preliminary design effort. Diffuser structures made of aluminum, fiberglass-reinforced plastics sandwich (FRP) and ferrocement were designed to common criteria by three teams, each of which were specialists in their particular medium. In addition, each team developed a production approach and a production costing estimate with about 10 to 15% accuracy. Extrapolations of these design point costs to other diffuser design configurations and expansion area ratios were developed based on costing rules recommended by the study teams. The conclusions of this study are that the best overall design approach for the DAWT's diffuser is of a hybrid, fiberglass sandwich skin mounted on an aluminum frame, construction.

1705 Environmental Aspects

REFER ALSO TO CITATION(S) 27090

1706 Wind Energy Engineering

REFER ALSO TO CITATION(S) 26988, 27040

27092 **(DOE/ET/20258—T1) Fourth annual progress report on the electrofluid dynamic wind generator. Final report, 1 April 1979-31 August 1980.** Minardi, J.E.; Lawson, M.O.; Wattendorf, F.L. (Solar Energy Research Inst., Golden, CO (USA); Dayton Univ., OH (USA). Research Inst.). May 1981. Contract AC02-77CH00178; AS02-76ET20258. 48p. (UDR-TR—80-108). NTIS, PC A03/MF A01. Order Number DE81024163.

In an EFD generator, charge particles of one polarity are seeded into a flowing neutral gas. Viscous interactions with neutral molecules drive the charged particles against an electrical potential and produce dc power of low current density and very high voltage. Demonstration of an energy economic method of producing and distributing low mobility charged droplets is described.

27093 **(SAND—81-7020) User's manual for the vertical axis wind turbine code VDART3.** Strickland, J.H.; Smith, T.; Sun, K. (Texas Tech Univ., Lubbock (USA)). Jun 1981. Contract AC04-76DP00789. 71p. NTIS, PC A04/MF A01. Order Number DE81026043.

The user's manual provides details on the Darrieus wind turbine aerodynamic performance/loads prediction computer code, VDART3. The code is the latest generation of vortex-based models and includes the effects of dynamic stall, pitching circulation, and added mass.

27094 (SERI/CP—635-1061, pp 9-15) **Tornado-type wind energy system: outline of recent developments.** Yen, J.T. (Grumman Aerospace Corp., Bethpage, NY). 1980. NTIS, PC A10/MF A01.

From 2. wind energy innovative systems conference; Colorado Springs, CO, USA (3 Dec 1980).

An outline of recent developments of Tornado-type Wind Energy System (TWES) is presented. Small models up to 1.1 m (42 inches) in tower height and 0.1 m (4 inches) in turbine diameter were tested in the Grumman Research tunnel, followed by a short test in the NASA Langely V/STOL Tunnel. The models tested were constructed with fixed omnidirectional peripheral vanes. Data obtained from the Grumman Tunnel show a best power coefficient based on the tower frontal area of around 14%, while the Langely test shows a maximum value of around 10%. A cost analysis based on a 10% power coefficent was carried out. Results show that for mass produced full-scale units the capital cost would be less than $700 per rated kW and the energy cost would be below 4 cents per kWh. Thus, it is concluded that the TWES has a good commercial potential, reinforcing the conclusions reached in previous cost analyses.

27095 (SERI/CP—635-1061, pp 19-25) **Tethered GyroTurbine wind energy system.** Noll, R.B. (Aerospace Systems, Inc., Burlington, MA); Ham, N.D. 1980. NTIS, PC A10/MF A01.

From 2. wind energy innovative systems conference; Colorado Springs, CO, USA (3 Dec 1980).

The GyroTurbine consists of a body/rotor system operating ian autogyro mode in the jet stream and tethered to a ground anchor system by a high strength cable. The rotor produces suffi-

cient power in the autogyro mode to sustain the weight of the entire system and to turn an induction generator which produces power in the megawatt range. The GyroTurbine is flown in a helicopter mode to lift the system into the jet stream or to recover the system. The GyroTurbine system and its operational modes are described, and its feasibility is discussed for systems of several sizes.

27096 (SERI/CP—635-1061, pp 37-53) **Preliminary report on an assessment of a tethered wind energy system.** Furuya, O.; Maekawa, S. (Tetra Tech, Inc., Pasadena, CA). 1980. NTIS, PC A10/MF A01.

From 2. wind energy innovative systems conference; Colorado Springs, CO, USA (3 Dec 1980).

In September 1980, a study was started for assessing a tethered energy system as a possible energy source in the near future under contract from the Solar Energy Research Institute of the Department of Energy of the United States. This is a preliminary report which describes the subjects to be studied in this project and thus identifies the problem areas to be clarified. In this study, emphasis will be placed upon several key items in implementing a Tetered Wind Energy System (TWES). Although other minor technical problems will be touched upon during the course of study, it is believed that if the key items are judged to be negative for the system implementation, the whole concept will become inadequate for further studies. These key items include the relationship between: (1) the rated power and altitude as a function of the seasonal wind speed, (2) required lifting force for carrying the platform and cable weight, and (3) generated power and cable diameter (i.e., power transmission problem). Since these three relationships are all interrelated, and iteration process will be employed by writing a simplified computer program to determine these relationships uniquely.

27097 (SERI/CP—635-1061, pp 55-65) **Preliminary study of a tethered wind energy system including the effect of a ducted rotor.** Sivier, K.R. (Univ. of Illinois, Urbana). 1980. NTIS, PC A10/MF A01.

From 2. wind energy innovative systems conference; Colorado Springs, CO, USA (3 Dec 1980).

A preliminary design study was made of a tethered wind energy system (TWES). Altitudes from 150m to 3050m were investigated. The basic study involved systems with free (or unducted) rotors. In addition, preliminary estimates were made of the effects of using a ducted rotor. Because of the increase in mean windspeed with altitude, the rotor diameter and the weight of the basic wind energy system (WES) decrease with altitude. However, the aerostat volume and the total TWES weight exhibit minimums at moderate (600 to 1200m) altitudes. It was found also that aerostat volume and TWES weight can be reduced by adding aerodymanic lift. Preliminary estimates suggest the potential for design and performance advantages with the use of ducted rotors.

27098 (SERI/CP—635-1061, pp 67-88) **Use of large amplitude bending-torsion flutter as a WECS mechanism.** Bielawa, R.L. (United Technologies Research Center, East Hartford, CT). 1980. NTIS, PC A10/MF A01.

From 2. wind energy innovative systems conference; Colorado Springs, CO, USA (3 Dec 1980).

An oscillating vane wind energy conversion system, incorporating the classic bending-torsion flutter characteristics of a cantilevered wing, is described. The system is characterized by relatively large response amplitudes and utilizes a construction scheme based on the high fatigue strength characteristics of a composite material. The results of an experimental and analytic investigation of the potential of this system are presented. The experimental results consist of the mechanical power generation, and dynamic response and stress characterics for a one meter span model. Two complementary analyses are described: a flutter eigensolution to calculate conditions for self-start, and a nonlinear time-history analysis to calculate output power characteristics. Results of the correlation of these analyses with test data are presented.

27099 (SERI/CP—635-1061, pp 91-101) **Cable strumming to collect wind power.** Payne, P.R. (Payne, Inc., Annapolis, MD). 1980. NTIS, PC A10/MF A01.

From 2. wind energy innovative systems conference; Colorado Springs, CO, USA (3 Dec 1980).

Galloping of power lines in a wind gives rise to large fatigue stresses which can cause failure. Mechanical power can be extracted from this phenomenon, but the brief study reported shows that the energy extraction efficiency is far too low. Two parallel cables across a valley are considered, the space between being covered in with plastic or cloth, so that the wing-like structure resulting would execute a coupled heave and pitch binary flutter. Preliminary indications are that such a system extracts can be a mile or more, this opens up the possibility of a one hundred Megawatt windmill.

27100 (SERI/CP—635-1061, pp 113-133) **Development of the dynamic inducer wind turbine.** Lissaman, P.B.S.; Zalay, A.D.; Hibbs, B. (AeroVironment Inc., Pasadena, CA). 1980. NTIS, PC A10/MF A01.

From 2. wind energy innovative systems conference; Colorado Springs, CO, USA (3 Dec 1980).

The performance benefits of the dynamic inducer tip vane system have been experimentally demonstrated for the first time. Wind tunnel tests conducted on a three-bladed 1.2m diameter rotor in the Caltech 10' wind tunnel have now shown that a dynamic inducer can achieve a power coefficient (based on power blade area) of 0.62 which exceeds that of the plain rotor by about 70%. The dynamic inducer substantially improves the performance of conventional rotors and indications are that higher power coefficients can be achieved through additional aerodynamic optimization. The wind tunnel measurements summarized in this paper suggest that the dynamic inducer can play a major role in future turbine technology. A new method for calculating wind tunnel corrections for augmented wind turbines is developed. This shows that corrections are very significant. For example, with a blockage of 16%, the corrected power coefficient is about 20% lower than that actually measured.

27101 (SERI/CP—635-1061, pp 143-162) **Concept for automatic blade pitch for a Darrieus vertical axis wind turbine.** Leigh, G.G. (Univ. of New Mexico, Albuquerque). 1980. NTIS, PC A10/MF A01.

From 2. wind energy innovative systems conference; Colorado Springs, CO, USA (3 Dec 1980).

A concept is revealed where the pitch angles of the blades of a Darrieus-type vertical axis wind turbine are automatically modulated by aerodynamic forces to provide improved angle of attack and increased power output from the turbine. The turbine blades are pivoted forward of the center of pressure so that aerodynamic forces tend to rotate the blades, thus changing the angle of attack and improving the aerodynamic performance. Counterbalance weights, located in the blade support struts, provide a mass balance about the blade pivot point, thus eliminating any centrifugal pitching forces on the blades. Springs and mechanical stops, located in the blade suport struts, are used to control the amount of blade pitch and return the blades to neutral when the aerodynamic lift forces are reduced. No mechanical or electromechanical mechanisms are utilized to achieve the improved performance; hence the cost of manufacturing and maintenance requirements for the turbine should be substantially reduced.

27102 (SERI/CP—635-1061, pp 169-188) **Research progress on the electrofliud dynamic wind generator.** Minardi, J.E.; Lawson, M.O. (Univ. of Dayton Research Inst., OH). 1980. NTIS, PC A10/MF A01.

From 2. wind energy innovative systems conference; Colorado Springs, CO, USA (3 Dec 1980).

The objective of the program is to conduct research leading to the successful development of electrofluid dynamic (EFD) wind generators. Application of the EFD direct energy conversion principle promises a simpler, less expensive system, free of frontal area and velocity limitations of conventional rotating wind energy conversion systems. The present research is directed toward the achievement of a third and last milestone, the energy economic production of charged water droplets having the proper characteristics for EFD wind energy application. This paper reports on the progress made toward attaining this third milestone.

20 ELECTRIC POWER ENGINEERING

REFER ALSO TO CITATION(S) 27249

2001 Power Plants And Power Generation

REFER ALSO TO CITATION(S) 26745, 27018, 27192, 27236, 27241, 27243

27103 (ANL/EES-TM—146) Probabilistic analysis of cost and performance uncertainty in technology evaluations. VanKuiken, J.C.; Hub, K.A. (Argonne National Lab., IL (USA)). Dec 1980. Contract W-31-109-ENG-38. 35p. NTIS, PC A03/MF A01. Order Number DE81027137.

Cost and performance uncertainties are major factors in the evaluation and comparison of electricity generating technologies. Comparisons of alternative technologies are typically based on estimates of future cost and performance, and uncertainties in these estimates can limit the reliability of these comparisons. The use of probabilistic methods is helpful in identifying the consequences and risks of multiple uncertainties. The purpose of this report is to consider uncertainty in evaluations and to describe an analytical approach developed to treat the problem. Propabilistic simulations are used to develop quantitative and reproducible results. Major attention is given to the problem of interdependencies among various uncertain components. Examples that incorporate some characteristics of two coal-based technologies are included to demonstrate the current level of capability and to emphasize the strengths and limitations of the method. The methods developed and applied here are used to define the relative importance of uncertainties of particular technologies and to identify which technologies have potentially lower costs for electricity.

27104 (CW-WR—76-02086) High temperature turbine technology program. Phase II. Technology test and support studies. Technical progress report, March 1-March 31, 1981. (Curtiss-Wright Corp., Wood-Ridge, NJ (USA). Power Systems Div.). Apr 1981. Contract AC01-76ET10348. 9p. (FE—2291-86). NTIS, PC A02/MF A01. Order Number DE81027197.

The overall objective of this program is to advance the technology of a high temperature, multi-stage, power turbine subsystem to a technology readiness condition. The current Phase II objective is to obtain, through technology testing and test support studies, the technical data required to complete the turbine subsystem designs started during Phase I and to be tested in Phase III. Progress is briefly described on the following tasks: (1) analytical prediction of TAC airfoils in a particulate-laden hot gas stream, (2) high-temperature low-emissions combustor, (3) TSTR test with contaminants, and (4) fuel cooled combustor. (WHK)

27105 (DOE/ET/15457—160) Long-Term Materials-Test Program. Annual report and Qualification Test Plan, October 1979-September 1980. (General Electric Co., Schenectady, NY (USA). Energy Systems Programs Dept.). Apr 1981. Contract AC21-79ET15457. 91p. NTIS, PC A05/MF A01. Order Number DE81025557.

Progress made on the Long Term Materials Test Program during its first year is summarized and the test planning required to perform the Qualification Test is documented. The objective of the Qualification Test is to check out the proper functioning of the Test Rig and to demonstrate its capability to produce a representative PFB off-gas environment for long term candidate-material testing. During the first year of the program, the project has progressed from the concept stage to the start of construction. Ninety-five percent of the equipment has been ordered and renovations to accommodate the test rig have been initiated at the Malta Site. The initial effort focused on the test rig configuration and selection of the candidate turbine materials. The preliminary design phase was officially culminated by the presentation and acceptance of the Preliminary Operations Plan to DOE during April 1980. By mid-June, 1981, the design of the major components was substantially complete allowing a detailed external design review to be performed. The design was accepted, and purchase orders for the major components were placed. In parallel with the design effort, two materials-screening tests have been initiated. One thousand hours of testing on the oil-fired small burner rig and the first 250-h segment on the erosion/corrosion simulator has been completed.

27106 (EPRI-CS—1819) Feasibility study for a forest-residue-fueled electric-generating plant. Final report, May 1981. (Nor'West-Pacific Corp., Seattle, WA (USA)). May 1981. 226p. (TPS—79-742). NTIS, PC A11/MF A01. Order Number DE81903484.

This study investigated the feasibility of locating and building a forest-residue-fueled electric generating plant in the heavily-forested, Western Cascades region of the upper Willamette Valley in Oregon. The quantity of forest residues that could be recovered, without competing with currently marketable forest products of greater value, was determined. Methods for removing, transporting, and processing the diseased boles, larger limbs, tops of trees, and broken chunks were investigated. The best means of storing and logging cull logs, chunks, and limbs over 6 inches in diameter and 6 feet long were investigated. The economics of various handling and processing methods were compared. A size and type of wood-fuel-fired boiler plant was selected that would operate in the full-condensing or cogeneration mode. A 50% extraction turbine-generator was used as the basis for economics calculations. The best combinations of components for this application were obtained from trade-off studies. The plant investment, total capital requirement, operating/maintenance costs and net busbar power costs were determined. A 24-MW power plant located in the vicinity of Oakridge, Oregon, would cost about $29,620,000 in January 1980 dollars. Due largely to high procurement and processing costs for forest residues, fuel costs were quite high (about $15.50/ton or $1.67/$10^6$ Btu as fired). For the Oakridge site, the net busbar power cost is 106 mills/kWh in the full-condensing mode of operation and 104 mills/kWh in the 50% extraction operating mode (at .67 capacity factor and steam sales price of $3/1000 pounds of steam). Busbar power costs levelized for a 10% discount rate and 6% inflation.

27107 (EPRI-PE—1865) Coal-fired power-plant-capital-cost estimates. Final report. Holstein, R.A. (Bechtel Power Corp., San Francisco, CA (USA)). May 1981. 166p. NTIS, PC A08/MF A01. Order Number DE81903492.

Conceptual designs and order-of-magnitude capital cost estimates have been prepared for typical 1000-MW coal-fired power plants. These subcritical plants will provide high efficiency in base load operation without excessive efficiency loss in cycling operation. In addition, an alternative supercritical design and a cost estimate were developed for each of the plants for maximum efficiency at 80 to 100% of design capacity. The power plants will be located in 13 representative regions of the United States and will be fueled by coal typically available in each region. In two locations, alternate coals are available and plants have been designed and estimated for both coals resulting in a total of 15 power plants. The capital cost estimates are at mid-1978 price level with no escalation and are based on the contractor's current construction projects. Conservative estimating parameters have been used to ensure their suitability as planning tools for utility companies. A flue gas desulfurization (FGD) system has been included for each plant to reflect the requirements of the promulgated New Source Performance Standards (NSPS) for sulfur dioxide (SO_2) emissions. The estimated costs of the FGD facilities range from 74 to 169 $/kW depending on the coal characteristics and the location of the plant. The estimated total capital requirements for twin 500-MW units vary from 8088 $/kW for a southeastern plant burning bituminous Kentucky coal to 990 $/kW for a remote western plant burning subbituminous Wyoming coal.

27108 (EPRI-WS—79-238(Vol.1), pp Section 1, 1.1-1.8) **Importance of synthetic fuels to oil-dependent utilities.** Schwartz, B. (Consolidated Edison Co. of New York, Inc., NY). May 1981. NTIS, PC A18/MF A01.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

Including long-term, hydroelectric purchase from Canada, about 12,000 megawatts of capacity is available to serve electric loads in the Con Edison service area. Some 76 percent is oil-fueled. In the early 1970s, we were allowed to build only oil- and gas-fueled plants in or near our service area because of environmental restrictions against coal. Today we have come full circle: we are no

longer able to build oil and gas plants, and for the most part we must look again to coal if we want to locate plants near our loads. The costs and impracticalities of replacement capacity clarify the choices. The break-even cost of clean synfuels for use in existing capacity compared to direct coal burning in replacement plants, if they could be sited and financed, is five times the cost of mine-mouth coal. That is our challenge to the synfuels industry - a challenge that the industry is confident it can meet. If we have a choice, the decision on what fuel we feed to our oil burners in the 1990s will be based primarily on the price and availability of synthetic fuel - primarily but not entirely. A domestic product is preferable to an imported one, and we are willing to make limited concessions on the initial price to obtain the inherent long-term savings and supply stability that synfuels offer. Even if the price of imported oil is lower in 1990 than that of synthetic fuel, the world oil price will catch up very quickly to that of a synthetic product made in a facility constructed for service, for example, by 1990. More than half of the high initial cost of synthetic fuel is due to carrying charges on the plant. This is a fixed amount, impervious to escalation and the whims of foreign oil ministers. Any escalation in the price of synthetic fuel should be due, for the most part, to increases in the cost of such variables as coal and other materials and labor. Even much of the coal costs can be fixed.

27109 (EPRI-WS—80-121, pp 2.1-2.4) **Introduction to heavy fuels testing at General Electric.** Rose, R.S. May 1981. NTIS, PC A14/MF A01.

From Workshop on deposition in utility gas turbines; Palo Alto, CA, USA (30 Oct 1980).

Air-cooled and water-cooled nozzles were tested. Early ash deposition results were encouraging; the ashes were easily removed. Various ash cleaning techniques were tested. 3 figures. (DLC)

2002 Environmental Aspects

REFER ALSO TO CITATION(S) 26789, 26790, 26791, 26792, 26793, 26794, 26795, 27564, 27637, 27638, 27639, 27647, 27662

27110 (CONF-810631—4) **Design of the Oak Ridge National Laboratory steam plant air-quality network in complex terrain.** Hougland, E.S.; Oakes, T.W. (Oak Ridge National Lab., TN (USA); Tennessee Univ., Knoxville (USA)). 1981. Contract W-7405-ENG-26. 15p. NTIS, PC A02/MF A01. Order Number DE81024087.

From 74. annual meeting of the Air Pollution Control Association; Philadelphia, PA, USA (21 Jun 1981).

As part of the nation's energy management program, the steam plant at the Oak Ridge National Laboratory is being converted from oil and gas to coal-fired operation. An important part of the overall conversion process is the determination of the environmental impact of this coal burning on air pollution levels in the vicinity of the laboratory. A model for the optimal design of an air quality monitoring system was used for the development of a network of samplers to monitor the air quality impacts of the fuel conversion. This paper reports the original effort to design the system and the extension of the design project to include other major air pollution sources in the vicinity of Oak Ridge, more representative meteorological data, and the explicit consideration of the complex terrain in the Oak Ridge area. Further extensions of this work to corporate wide quality management planning are also discussed.

27111 (DOE/ET/12442—T1) **Design and test of an exhaust-gas clean-up system for powerplants using high-sulphur-content fuels.** (International Power Technology, Inc., Sunnyvale, CA (USA)). 23 Jan 1979. Contract AC03-78ET12442. 30p. NTIS, PC A03/MF A01.

The progress to date for each major element of the program is graphed. A description of each program element is given. Completion of the data acquisition system has slipped due to a delay in delivery from Hewlett Packard. Part of the labor costs allocated for this includes time for personnel to become familiar with the equipment and to integrate the system with the test set-up. Completion of the test cell and the fuel system has slipped. This has turned out to be a significant undertaking and is being paced by the three contractors supplying the plumbing, air conditioning and fuel tank. Completion of each is now scheduled for March 1, and no slippage in the completion of the exhaust gas simulator is anticipated. The other element underway is a pilot model of the two-stage deaeration system. This work is briefly described.

27112 (EPRI-WS—79-220(Vol.1)) **Joint symposium on stationary combustion NO/sub x/ control: proceedings.** (Electric Power Research Inst., Palo Alto, CA (USA). Coal Combustion Systems Div.). May 1981. 618p. NTIS, PC A99/MF A01. Order Number DE81903301.

The Joint Symposium on Stationary Combustion NO/sub x/ Control consisted of over 50 presentations describing recent advances in NO/sub x/ control technology, including applications for pulverized coal-fired utility boilers. Volume I of the Proceedings contains manuscripts documenting the presentations in four sessions. These papers address the regulatory aspects of NO/sub x/ emissions and NO/sub x/ control through burner design and combustion modification. NO/sub x/ Emission Issues (Session I) addresses regulatory topics such as the short-term ambient NO_2 standard, acid rain concerns, etc. The Manufacturers Update of Commercially Available Combustion Technology (Session II) describes advanced burner designs for NO/sub x/ control that are currently offered by the utility boiler manufacturers. NO/sub x/ Emission Characterization of Full-Scale Utility Powerplants (Session III) presents results of recent field tests evaluating combustion modifications and other low NO/sub x/ approaches. Low NO/sub x/ Combustion Development (Session IV) details the recent progress in the development of advanced low NO/sub x/ firing systems not yet commercially available.

27113 (EPRI-WS—79-220(Vol.1), pp 54-95) **Development and field operation of the controlled flow/split-flame burner.** Vatsky, J. (Foster Wheeler Energy Corp., Livingston, NJ). May 1981. NTIS, PC A99/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

An advanced low NO/sub x/ coal burner has been installed in a 375 MW front-wall fired steam generator. Unstaged NO/sub x/ levels below 0.4 lb/million Btu are being consistantly obtained with burners having a maximum liberation rate of 285 million Btu/hr. Prototype tests of this burner, in a 50 million Btu/hr test furnace, have resulted in unstaged NO/sub x/ emissionsof 0.25 lb/million Btu; when stated using overfire air ports emissions were reduced below 0.20 lb/million Btu. This high capacity low NO/sub x/ burner permits new steam generators to be equipped with the same number of burners and the same type of burner management system as were used prior to the advent of emission regulations. The Foster Wheeler low NO/sub x/ system is also available for retrofit to older steam generators. This availability is timely in that it provides an option for utilities, which must convert from oil to coal, to use a modern combustion system. This can be of particular importance to those units which were designed to fire future coal, based on the boiler, firing system and performance coal availability of the 1950's and 1960's, but have instead been firing oil. A further advantage may be provided by the large NO/sub x/ reductions attainable since these may permit trade-offs within the EPA's bubble concept. However, the actual NO/sub x/ levels attainable for older units would be site-dependent. 10 graphs, 4 drawings, 4 photos.

27114 (EPRI-WS—79-220(Vol.1), pp 98-122) **Fossil steam generator NO/sub x/ control update.** Barsin, J.A. (Babcock and Wilcox Co., Barberton, OH). May 1981. NTIS, PC A99/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

Since the Second NO/sub x/ Control Seminar of 1978, much additional information has been collected concerning actual NO/sub x/ emissions from fossil fuel power plants equipped with B & W Dual Register Burners/Compartmented Windbox furnace systems for a wide range of both bituminous and subbituminous coals. These field results from actual units firing coal, oil and/or gas have demonstrated NO/sub x/ reductions of up to 60 percent compared to units without NO/sub x/ control. This presentation will show our controlled NO/sub x/ emission level experience and the present status of B & W's advanced NO/sub x/ control systems to meet the more restrictive NO/sub x/ emission levels expected in the future. 7 graphs; 4 drawings.

27115 (EPRI-WS—79-220(Vol.1), pp 124-159) **Current developments in low NO/sub x/ firing systems.** Kawamura, T. (Mitsubishi Heavy Industries, Ltd., Tokyo, Japan); Frey, D.J. May 1981. NTIS, PC A99/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

Low NO/sub x/ firing systems for natural gas and oil were developed for horizontal and tangential firing. The oil and natural gas PM firing system uses fuel rich and fuel lean regions in combination with flue gas recirculation to achieve low NO/sub x/ emissions, the former region being produced by a diffusion flame, while the latter is produced by a premixed flame. The pulverized coal separate gas recirculation (SGR) and low NO/sub x/ concentric firing (LNCFS) tangential firing systems achieve low NO/sub x/ emissions by delaying mixing of the main combustion air with the fuel. 20 graphs, 10 drawings, 4 tables.

27116 (EPRI-WS—79-220(Vol.1), pp 162-183) **Evaluation of NO/sub x/ emissions from coal-fired steam generators.** Lisauskas, R.A.; Marshall, J.J. (Riley Stoker Corp., Worcester, MA). May 1981. NTIS, PC A99/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

The design evolution of the Riley coal-fired TURBO Furnace and Directional Flame Burner is reviewed. Burner aerodynamics are characterized and the effectiveness of burner adjustments and staged combustion in reducing NO/sub x/ emissions in this unique firing system are discussed. Field test emissions data are presented and analyzed with respect to burner operating variables. A decrease in NO/sub x/ emissions is observed as mixing of fuel and air in the near burner zone is delayed. Further development of directional flame and controlled mixing burners for coal-firing applications is also discussed. 12 drawings, 2 graphs, 2 tables.

27117 (EPRI-WS—79-220(Vol.1), pp 186-236) **Fireside corrosion and NO/sub x/ emission tests on coal-fired utility boilers.** Manny, E.H.; Natanson, P.S. (Exxon Research and Engineering Co., Florham Park, NJ). May 1981. NTIS, PC A99/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

This paper describes the status of an EPA-sponsored (Environmental Protection Agency) field study of NO/sub x/ emissions from coal-fired utility boilers. Previous reports discussed the effectiveness of combustion modification techniques to significantly reduce NO/sub x/ emissions. The simultaneous investigation of side effects (e.g., particulate emissions, boiler slagging, boiler performance) did not identify any significant problems. However, one potential side effect - fireside corrosion of the boiler waterwalls - was only partially studied. Fireside corrosion rates obtained via probes (short-term exposure) could not be correlated conclusively with actual furnace tube wastage experience. Therefore, a long-term corrosion test was undertaken to obtain representative furnace tube corrosion rate data. Results of this test, conducted on the 500 MW No. 7 pulverized-coal-fired boiler at the Crist Station of the Gulf Power Company, are presented and discussed. Details and a progress update are also given for ongoing corrosion investigations sponsored by EPA on four large coal-fired utility boilers designed to meet NSPS NO/sub x/ emission standards. Information is also included on a field test using additives to suppress slag formation in a 330 MW pulverized-coal-fired utility boiler. 3 graphs, 5 drawings, 12 tables.

27118 (EPRI-WS—79-220(Vol.1), pp 237-267) **NO/sub x/ emissions characteristics of arch-fired furnaces.** Sonnichsen, T.W. (KVB, Inc., Irvine, CA); Cichanowicz, J.E. May 1981. NTIS, PC A99/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

Field tests have been conducted on three subbituminous pulverized-coal arch-fired utility boiler configurations. The objective of these tests was to determine as-found NO/sub x/ emission levels and the influence of combustion modifications on these emissions. These configurations are unique in that the coal is introduced downward from the arch into the furnace with the bulk of the combustion air added through the front wall perpendicular to the flame jet. Staged combustion conditions are thereby generated which have been shown to be conducive to low NO/sub x/ emissions. Corrected NO levels ranged from 200 ppM to 350 ppM. The lowest emissions were emitted from the largest (275 MW) boiler. Variations in excess air, air flow injection distribution between burner and front wall and burner stoichiometry were shown to reduce NO emissions by 5 to 35 percent. A discussion of these results is presented. 3 drawings, 7 graphs, 3 tables.

27119 (EPRI-WS—79-220(Vol.1), pp 270-309) **Combined-cycle powerplant emissions.** Langsjoen, P.L. (KVB, Inc., Irvine, CA); Thompson, R.E.; Muzio, L.J.; McElroy, M.W. May 1981. NTIS, PC A99/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

The retrofit of existing utility steam boilers with a combustion gas turbine to supply hot vitiated combustion air to the windbox of a fired boiler, in place of the normal forced-draft fans and air preheaters can lead to increased power output at improved heat rates. A major consideration in converting to combined-cycle operation is the impact on the nitrogen oxides (NO/sub x/) emissions from the system. A field test program was conducted to determine the NO/sub x/ characteristics of a 220-MW supplementary-fired unit. A primary objective was to determine the fraction of the gas-turbine-generated NO/sub x/ that can potentially be reduced upon passage through the combustion zone of the boiler. As part of this test program, the boiler was operated in a low-NO/sub x/, staged-combustion configuration by removing selected burners from service. Baseline NO/sub x/ emissions from the combined-cycle system were found to be substantially lower than NO/sub x/ emissions from the boiler alone when operated with ambient air supplied by forced-draft fans. In a staged-combustion configuration with four of twenty burners removed from service, the combined-cycle NO/sub x/ emissions were reduced further. The fraction of gas-turbine-generated NO/sub x/ reduced upon passage through the combustion zone of the boiler was determined by doping the gas turbine fuel with nitrogen (ammonia) to artificially vary the boiler inlet NO/sub x/ levels during combined-cycle operation. The results showed that during normal operation of the combined-cycle system with all burners in service, 10 to 28 percent of the NO/sub x/ produced by the gas turbine was reduced (destroyed) in the supplementary fired boiler. During operation of the boiler in a combustion configuration staged by removing four burners from service, a greater portion of the gas-turbine-generated NO/sub x/ was reduced in the boiler. 3 drawings, 5 graphs, 4 tables.

27120 (EPRI-WS—79-220(Vol.1), pp 312-329) **Relationship between NO/sub x/ and fine particle emissions.** McElroy, M.W.; Carr, R.C. (Electric Power Research Inst., Palo Alto, CA). May 1981. NTIS, PC A99/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

Data from EPRI-sponsored field test programs at pulverized coal-fired utility power plants indicate that boiler combustion conditions producing low NO/sub x/ emissions also tend to suppress the generation of fine, submicron particulate matter. Specifically, the mass of fine particles measured at the outlet of boilers in the 0.1-micrometer diameter region are reduced by up to one or more orders of magnitude when low NO/sub x/ emissions are observed. These observations are consistent with the present theories of volatilization/condensation processes believed to be responsible for particle generation in the fine particle size region. The significance of this discovery is that particulate collectors (electrostatic precipitators and fabric filter baghouses) generally exhibit a minima in collection efficiency at this particle size region. Furthermore, these particles: (1) can contribute to visibility problems due to particle growth within the plume, and (2) have been implicated as bad actors from a health effects standpoint due to their possible enrichment in trace elements and unfavorable transport properties. It now appears that these deficiencies inherent to particulate control devices may, in part, be overcome by the application of NO/sub x/ combustion control. 7 graphs, 1 table.

27121 (EPRI-WS—79-220(Vol.1), pp 332-380) **Commercial evaluation of a low NO/sub x/ combustion system as applied to coal-fired utility boilers.** Johnson, S.A.; Sommer, T.M. (Babcock & Wilcox Co., Alliance, OH). May 1981. NTIS, PC A99/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

Development testing of an advanced, two-stage combustion system, capable of limiting NO/sub x/ emissions from pulverized coal-fired boilers to less than 0.2 LB/sub m/NO_2/10^6 Btu has been completed. Test programs have been conducted on both a 1.2 MW/sub T/ and 10.2 MW/sub T/ system. These tests have confirmed that NO/sub x/ emissions can be correlated to a dimensionless parameter proportional to the second stage flame temperature. In addition, scaleup criteria were formulated which allowed the design of commercial scale low NO/sub x/ combustion systems. Subsequently, a detailed engineering evaluation was performed on two candidate applications of this technology. The objectives of that study were: (1) to refine scaleup correlations and design procedures; (2) to conceptually design a steam generator incorporating the two stage combustion concept; (3) to economically evaluate that design as compared to a conventional, post-NSPS steam generator design; and (4) to identify areas of commercial concern with the new designs and to recommend further research to address these concerns. This paper summarizes the significant results and conclusions from the test programs and the engineering study. The favored Venturi furnace system is expected to limit NO/sub x/ emissions from coal-fired boilers to less than 0.2 LB NO_2/10^6 Btu, while increasing the capital cost of the boilers by significantly less than the projected costs of tailend NO/sub x/ removal systems to meet future strict NO/sub x/ emission standards. 8 drawings, 9 graphs, 2 tables.

27122 (EPRI-WS—79-220(Vol.1), pp 382-423) **Pilot scale evaluation of a low NO/sub x/ tangential firing method.** Kelly, J.T.; Brown, R.A.; Wightman, J.B.; Pam, R.L.; Chu, E.K. (Acurex Corp., Mountain View, CA). May 1981. NTIS, PC A99/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

The Environmental Protection Agency (EPA)/Acurex 293 kWt pilot-scale facility was used to develop a low-NO/sub x/ pulverized coal-fired tangential system. Low NO/sub x/ is achieved by directing the fuel and less than 20 percent of the secondary combustion air into the center of the furnace with the remaining secondary combustion air directed parallel to the furnace walls. The separation of secondary combustion air in this manner creates a fuel-rich zone in the center of the furnace where NO/sub x/ production is minimized. This combustion modification technique has lowered NO/sub x/ 65 percent relative to conventional tangential firing. In addition, CO, UHC, and unburned carbon emissions are substantially unaffected by the modification. Also, the modification places a blanket of air on the furnace walls which is beneficial from a wall corrosion and slagging point of view. Finally, the modification shows a decrease in NO/sub x/ emissions as firebox gas temperature is increased. This characteristic might be beneficially applied in a large-scale system to reduce furnace volume, and thereby capital cost, for a given combustion heat release. Tests are now underway to further optimize and characterize this low-NO/sub x/ combustion modification technique. 7 drawings, 8 graphs, 1 table.

27123 (EPRI-WS—79-220(Vol.1), pp 426-450) **Development of distributed mixing pulverized coal burners.** Rees, D.P.; Lee, J.; Brienza, A.R.; Heap, M.P. (Energy and Environmental Research Corp., Santa Ana, CA). May 1981. NTIS, PC A99/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

This paper summarizes work sponsored by the EPA to establish generalized design criteria for low emission pulverized coal burners. Data for single and multiple configurations in research furnaces at 50 and 100 x 10^6 Btu/hr are presented with the current design of distributed mixing burners. NO/sub x/ emissions down to 100 ppM (0% O_2, dry) have been obtained for bituminous coals under acceptable burnout conditions by sub-stoichiometric burner staging. These data show that the optimum burner zone stoichiometry is approximately 70 percent of theoretical air for all burners tested to date. 2 drawings, 6 graphs, 5 tables.

27124 (EPRI-WS—79-220(Vol.1), pp 452-490) **Development of a low NO/sub x/ distributed mixing burner for pulverized coal boilers.** Folsom, B.A. (Energy and Environmental Research Corp., Irvine, CA); Nelson, L.P.; Vatsky, J. May 1981. NTIS, PC A99/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

This paper describes the development of a low NO/sub x/ pulverized coal burner for demonstration in two small pulverized coal-fired boilers by 1982. The Distributed Mixing Burner concept provides for controlled mixing of the coal with the combustion air to minimize NO/sub x/ emissions while maintaining an overall oxidizing environment in the furnace to minimize slagging and corrosion. The design of a prototype field operable burner is discussed, and test data in a research facility suggesting that NO/sub x/ emissions less than 84 ng/J (0.2 lb/10^6 Btu) might be attainable in the field are presented. 6 graphs, 6 drawings, 4 tables.

27125 (EPRI-WS—79-220(Vol.1), pp 492-534) **Field evaluation of low emission coal burner technology on a utility boiler.** Campobenedetto, E.J. (Babcock & Wilcox Co., Barberton, OH). May 1981. NTIS, PC A99/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

A program is currently in progress to demonstrate the NO/sub x/ reduction potential of the EPA distributed mixing burner applied to a utility boiler. The demonstration program will be designed to evaluate both emissions attributed to this burner as well as the effects of the burner retrofit on overall boiler performance and efficiency. The boiler selection process is near completion with a single wall-fired unit being reviewed by the EPA prior to final negotiations. Several opposed-fired units are still under consideration, pending final decisions by the utilities as to their interest in participating in the retrofit demonstration program. 3 graphs; 2 drawings; 11 tables.

27126 (EPRI-WS—79-220(Vol.1), pp 536-562) **Operating experience and field data of a 700 MW coal-fired utility boiler with retrofit low NO/sub x/ staged mixing burners.** Leikert, K.; Michelfelder, S. (L. & C. Steinmueller GmbH, Gummersbach, West Germany). May 1981. NTIS, PC A99/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

Forthcoming new federal regulations on emission control for stationary combustion systems will clearly define tolerable NO/sub x/-emission levels in Germany and thus replace the present best technical means approach. This fact gave reason to the initiation of a R & D program for the development of cost effective low NO/sub x/-combustion equipment for use in pulverized coal fired boilers. As a first step a distributed mixing burner design concept adopted for an envisaged 50% NO/sub x/-reduction was tested and optimized in a pilot plant test program with a 2.5 MW burner. The burner design concept was based on a conventional circular burner with additional tertiary air nozzles distributed concentrically about the burner mouth. Within this program a 65% NO/sub x/ reduction was achieved with an optimized configuration of the distributed mixing - respectively staged mixing burner (SM-burner) without disadvantageous changes in combustion and emission characteristics. Following the successful pilot plant tests the combustion equipment of a 700 MW coal fired power station was changed to SM-burners. Both to ease the retrofit and to safely allow the execution of a measuring program as retrofit burner, a modified version of the optimized pilot burner design was used for the boiler. The modification resulted in a limitation of the safely operable tertiary air mass flows and thus to a certain extent reduced the staging capability of the large burner. In spite of the narrower operational limits the envisaged goal of a 50% NO/sub x/ reduction was met in the boiler demonstration tests. Furthermore a burner load dependent automatic secondary/tertiary air flow control system, developed to guarantee a safe burner operation at low NO/sub x/ levels over a wide turn down ratio, was operated successfully. 3 drawings, 12 graphs.

27127 (EPRI-WS—79-220(Vol.1), pp 564-611) **Japanese technical development for combustion NO/sub x/ control.** Mouri, K.; Nakabayashi, Y. (Electric Power Development Co., Ltd., Tokyo, Japan). May 1981. NTIS, PC A99/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

Electric Power Development Co., Ltd. (EPDC) has been executing a research and development program on combustion NO/sub x/ control for coal-fired boilers in cooperation with Japanese boiler manufacturers. Target NO/sub x/ emission levels of 100 ppM or below (O_2 = 6%, N = 1.8%) have been defined and to date have not been achieved. However, results obtained from this program have been applied in a stepwise manner to existing or new coal-fired power plants. NO/sub x/ emission levels for existing plants have been reduced to 160 to 300 ppM (O_2 = 6%, N = 1.2%) in comparison to uncontrolled levels of 400 to 500 ppM. Regarding new coal-fired boilers, EPDC is constructing two 250-MW boilers with target emission levels of 250 ppM (0 = 6%, N = 1.7%) at the Matsushima Thermal Power Station. In addition, plans are to construct a 700 MW boiler at Takehara (No. 3 unit) with target emission levels of 200 ppM. Presently, EPDC believes that NO/sub x/ emission levels will be 150 ppM (O_2 = 6%, N = 1.8% design base) for the No. 3 unit boiler. This report describes ongoing R & D programs, and the results of combustion modification efforts (such as the technology development of low NO/sub x/ burners, two-stage combustion, gas mixing, etc.), and low NO/sub x/ countermeasures for new boilers. 7 drawings, 9 graphs, 16 tables.

27128 **(EPRI-WS—79-220(Vol.2)) Joint symposium on stationary combustion NO/sub x/ control: proceedings.** (Electric Power Research Inst., Palo Alto, CA (USA). Coal Combustion Systems Div.). May 1981. 368p. NTIS, PC A17/MF A01. Order Number DE81903302.

The Joint Symposium on Stationary Combustion NO/sub x/ Control consisted of over 50 presentations describing recent advances in NO/sub x/ control technology, including applications for pulverized coal-fired utility boilers. Volume II of the Proceedings contains manuscripts documenting the presentations in three sessions. These papers address postcombustion control (flue gas treatment), and emissions characterization of other combustion-generated species. Postcombustion NO/sub x/ Control (Session Va) summarizes current efforts to assess one type of postcombustion control process (selective catalytic reduction) in the United States, and updates development programs in Japan. Status of Flue Gas Treatment for Coal-Fired Boilers (Session VI) summarizes commercial systems offered from six process vendors. Environmental Assessment (Session IX) details efforts to fully characterize the emissions of NO/sub x/ and other combustion-generated emissions from utility powerplants and conventional combustion sources.

27129 (EPRI-WS—79-220(Vol.2), pp 974-988) **Utility boiler environmental assessment: the EPRI approach.** Zengerle, M.W. (Electric Power Research Inst., Palo Alto, CA). May 1981. NTIS, PC A17/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

EPRI's environmental assessment program for air emissions comprises physical and chemical characterization, ecological and human health research and an integrated analysis of costs, benefits and risks associated with various generating technology and emission control approaches. Physical and chemical characterization is approached from both a regional and localized aspect and includes primary and secondary pollutants. Regional transport research began with the Sulfate Regional Experiment (SURE) in the Northeastern US and continues with visibility and acid deposition research in the East and West. Localized plume distribution is being studied on a site-specific basis beginning with simple and continuing with more complex terrain. Both efforts include extensive field measurement programs designed to evaluate or develop modeling techniques for predicting utility contributions to ground-level concentrations or deposition. Ecological research currently emphasizes the potential effects of acid deposition and includes watershed, aquatic, forest, crop, and grassland research. Current studies focus on biogeochemical processes which influence resultant soil and water acidity and nutrient balance. Health effects research concentrates on determining human health effects of airborne utility emissions using animal studies, human clinical studies and epidemiology. The ultimate objective of these research efforts is the evaluation of relative risk of generation mixes and emission control strategies.

2003 Power Transmission And Distribution

REFER ALSO TO CITATION(S) 27186

27130 **(DOE/CE/29325—1) Fundamental optimization study for open-wire transmission systems.** (Power Technologies, Inc., Schenectady, NY (USA)). Feb 1980. Contract AC01-78ET29325. 116p. NTIS, PC A06/MF A01. Order Number DE81025675.

The physical factors that control the loading capability of open wire transmission systems have been examined. Surge impedance loading (SIL) capability was used as the criterion for optimization. The SIL of various arrays was calculated and optimized. Some guidelines for the optimization of SIL were developed as a function of the amount of conductor material and available space. The major variables studied were as follows: the relationship between SIL, power density, and electric field gradient; the effect of bundling; the effect of conductor location within the available space; and the effect of the magnitude and phase relationship of the energizing vectors.

27131 **(LBL—12451) Superconducting fluctuations and the transmission line model.** Lemberger, T.R. (Lawrence Berkeley Lab., CA (USA)). Apr 1981. Contract W-7405-ENG-48. 6p. (CONF-810809—9). NTIS, PC A02/MF A01.

From 16. international conference on low temperature physics; Los Angeles, CA, USA (19 Aug 1981).

A recent calculation of the amplitude of charge-imbalance fluctuations in superconductors is shown to be consistent with the transmission line model of charge-imbalance dynamics due to Kadin et al. when thermal noise across the capacitance of the line is included in the model. This agreement justifies the calculation of the mean square amplitude of fluctuations of the local supercurrent by using the transmission line inductance. For a two-dimensional film, this results in an intrinsic pair-breaking rate which is proportional to the resistance per square of the film.

21 NUCLEAR POWER PLANTS

2101 Power Reactors, Non-breeding, Light-water Moderated, Boiling Water Cooled

REFER ALSO TO CITATION(S) 27165, 27171, 27179, 27180, 27181, 27182

27132 **(CONF-810803—4) Influence of FRAPCON-1 evaluation models on fuel behavior calculations for commercial power reactors.** Chambers, R.; Laats, E.T. (EG and G Idaho, Inc., Idaho Falls (USA)). 1981. Contract AC07-76ID01570. 6p. NTIS, PC A02/MF A01.

From Topical meeting on reactor safety aspects of fuel behavior; Sun Valley, ID, USA (2 Aug 1981).

A preliminary set of nine evaluation models (EMs) was added to the FRAPCON-1 computer code, which is used to calculate fuel rod behavior in a nuclear reactor during steady-state operation. The intent was to provide an audit code to be used in the United States Nuclear Regulatory Commission (NRC) licensing activities when calculations of conservative fuel rod temperatures are required. The EMs place conservatisms on the calculation of rod temperature by modifying the calculation of rod power history, fuel and cladding behavior models, and materials properties correlations. Three of the nine EMs provide either input or model specifications, or set the reference temperature for stored energy calculations. The remaining six EMs were intended to add thermal conservatism through model changes. To determine the relative influence of these six EMs upon fuel behavior calculations for commercial power reactors, a sensitivity study was conducted. That study is the subject of this paper.

27133 **(DOE/ET/34203—41) Dilute chemical decontamination program. Quarterly report 5, October 1-December 31, 1978.** Anstine, L.D. (General Electric Co., San Jose, CA (USA). Nuclear Engineering Div.). Jun 1980. Contract AC02-76ET34203. 68p. (NEDC—12705-5). NTIS, PC A04/MF A01. Order Number DE81025690.

The nominal concentrations for oxalic acid and citric acid were selected to be 0.01 and 0.005 M, respectively; the process conditions were selected to be pH3 and 90°C with a controlled dissolved oxygen concentration. Additions of acridine, EDTA, and HEDTA with rapid regeneration were not successful in preventing the formation of ferrous-oxalate films on carbon steel surfaces. Control of the dissolved oxygen at an intermediate level prevents ferrous-oxalate precipitation but allows for the highest dissolution rate of fuel deposits. Six mini-loop tests indicated that no measurable quantities of ferrous oxalate will be left on steel surfaces at the end of a decontamination .20 to 50% of the Co-60 in the ferrous-oxalate films will be released during the purification process; however, the resulting iron oxide film will retain some of the Co-60. The data from the Vallecitos Nuclear Center (VNC) test loop run conducted with 0.02 M oxalic acid were analyzed. The Co-60 concentrations in solution were calculated for the mini-loop runs and the VNC test loop runs using the modified regeneration equation and were in agreement with measurement. A corrosion loop test was conducted to evaluate the effects of 0.02 M oxalic acid on 10 alloys or metallurgical conditions. Corrosion rates were acceptably low.

27134 **(DOE/ET/34203—42) Dilute chemical decontamination program. Semi-annual report (quarters 6 and 7), January 1-June 30, 1979.** Anstine, L.D. (General Electric Co., San Jose, CA (USA). Nuclear Engineering Div.). Sep 1980. Contract AC02-76ET34203. 105p. NTIC, PC A06/MF A01. Order Number DE81025691.

An analytical procedure for determining oxalate and citrate in a solution was developed. The gamma dose rates from fuel bundles were determined at several locations. The radiolytic decomposition rates of oxalic and citric acids in solution were measured. Resins were evaluated for the regeneration of solutions of oxalic and citric acids containing Fe(III) and Co(II). Tests indicated the optimum condition for the preloaded anion-exchange resin was for the resin to be in equilibrium with the desired decontamination solution. The option of adding a small amount of cation-exchange resin to the preloaded anion-exchange resin to remove the divalent cations including Co-60 is feasible. Three VNC Test Loop Runs (3, 4 and 5) were completed using solutions of oxalic and citric acids and the preloaded anion-exchange regeneration process. Based on Runs 3 and 4, solvent and operation specifications were modified. The oxalate concentration was incrased from 0.01 to 0.012 M and the dissolved oxygen concentration was established at 0.75 +- 0.25 ppM. In Run 5, more than 85% of the Co-60 was removed from the Nine Mile Point pipe specimen in 12 hours using the new specifications.

2102 Power Reactors, Non-breeding, Light-water Moderated, Non-boiling Water Cooled

REFER ALSO TO CITATION(S) 27132, 27158, 27164, 27165, 27172, 27173, 27176, 27177

27135 **(DOE/TIC—1021474) Analysis of an ultrasonic level device for in-core Pressurized Water Reactor coolant detection.** Johnson, K.R. (Oak Ridge National Lab., TN (USA)). 13 Apr 1981. Contract W-7405-ENG-26. 29p. NTIS, PC A03/MF A01.

A rigorous semi-empirical approach was undertaken to model the response of an ultrasonic level device (ULD) for application to in-core coolant detection in Pressurized Water Reactors (PWRs). An equation is derived for the torsional wave velocity v/sub t phi/ in the ULD. Existing data reduction techniques were analyzed and compared to results from use of the derived equation. Both methods yield liquid level measurements with errors of ~ 5%. A sensitivity study on probe performance at reactor conditions predicts reduced level responsivity from data at lower temperatures.

27136 **(HEDL-TME—80-89) Destructive examination of 3-cycle LWR fuel rods from Turkey Point Unit 3 for the Climax-Spent Fuel Test.** Atkin, S.D. (Hanford Engineering Development Lab., Richland, WA (USA)). Jun 1981. Contract AC14-76FF02170. 71p. NTIS, PC A04/MF A01. Order Number DE81026313.

The destructive examination results of five light water reactor rods from the Turkey Point Unit 3 reactor are presented. The examinations included fission gas collection and analyses, burnup and hydrogen analyses, and a metallographic evaluation of the fuel, cladding, oxide, and hydrides. The rods exhibited a low fission gas release with all other results appearing representative for pressurized water reactor fuel rods with similar burnups (28 GWd/MTU) and operating histories.

2103 Power Reactors, Non-breeding, Graphite Moderated

REFER ALSO TO CITATION(S) 27163

27137 **(GA-A—16000) Nondestructive examination of 51 fuel and reflector elements from Fort St. Vrain Core Segment 1.** Miller, C.M.; Saurwein, J.J. (General Atomic Co., San Diego, CA (USA)). Dec 1980. Contract AT03-76ET35300. 102p. NTIS, PC A06/MF A01. Order Number DE81026555.

Fifty-one fuel and reflector elements irradiated in core segment 1 of the Fort St. Vrain High-Temperature Gas-Cooled Reactor (HTGR) were inspected dimensionally and visually in the Hot Service Facility at Fort St. Vrain in July 1979. Time- and volume-averaged graphite temperatures for the examined fuel elements ranged from ~ 400° to 750°C. Fast neutron fluences varied from ~ 0.3 x 10^{25} n/m^2 to 1.0 x 10^{25} n/m^2 (E > 29 fJ)/sub HTGR/. Nearly all of the examined elements shrank in both axial and radial dimensions. The measured data were compared with strain and bow predictions obtained from SURVEY/STRESS, a computer code that employs viscoelastic beam theory to calculate stresses and deformations in HTGR fuel elements.

27138 **(GA-A—16056) Interpretation of bend strength increase of graphite by the couple-stress theory.** Tang, P.Y. (General Atomic Co., San Diego, CA (USA)). May 1981. Contract AT03-76ET35301. 11p. (CONF-810801—49). NTIS, PC A02/MF A01. Order Number DE81024385.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

This paper presents a continued evaluation of the applicability of the couple-stress constitutive theory to graphite. The evaluation is performed by examining four-point bend and uniaxial tensile data of various sized cylindrical and square specimens for three grades of graphites. These data are superficially inconsistent and, usually, at variance with the predictions of classical theories. Nevertheless, this evaluation finds that they can be consistently interpreted by the couple-stress theory. This is compatible with results of an initial evaluation that considered one size of cylindrical specimen for H-451 graphite.

27139 **(GA-A—16241) Transient stress wave propagation in HTGR fuel element impacts.** Almajan, I.T.; Smith, P.D. (General Atomic Co., San Diego, CA (USA)). Feb 1981. Contract AT03-76DT35300. 23p. (CONF-810801—40). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

A study of transient stress wave propagation in graphite HTGR fuel elements has been undertaken as a step toward developing techniques for the evaluation of seismic impact loads. The objectives of the study were to identify appropriate numerical methods, to understand the influence of the geometry and the multiple holes on the response, and to determine the relative importance of high frequency response and lower mode vibrations. A general review is made of the dynamic contact problem, and the methods available to model impact phenomena and stress wave propagation are evaluated.

27140 (GA-A—16333) HTGR Fuel Technology Program. Semiannual report for the period ending March 31, 1981. (General Atomic Co., San Diego, CA (USA)). May 1981. Contract AT03-76ET35300. 114p. NTIS, PC A06/MF A01. Order Number DE81026556.

This document reports the technical accomplishments on the HTGR Fuel Technology Program at General Atomic during the first half of FY-81. The activities include the fuel process, fuel materials, fuel cycle, fission product transport, and core component verification testing tasks necessary to support the design and development of a steam cycle/cogeneration (SC/C) version of the HTGR with a follow-on reformer (R) version. An important effort which was initiated during this period was the preparation of input data for a long-range technology program plan.

27141 (UCRL—85617) Structure interaction due to thermal bowing of shrouds in steam generator of gas-cooled reactor. Woo, H.H. (Lawrence Livermore National Lab., CA (USA)). 1 Jan 1981. Contract W-7405-ENG-48. 8p. (CONF-810801—46). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

The design of the gas-cooled reactor steam generators includes a tube bundle support plate system which restrains and supports the helical tubes in the steam generator. The support system consists of an array of radially oriented, perforated plates through which the helical tube coils are wound. These support plates have tabs on their edges which fit into vertical slots in the inner and outer shrouds. When the helical tube bundle and support plates are installed in the steam generator, they most likely cannot fit evenly between the inner and outer shrouds. This imperfection leads to different gaps between two extreme sides of the tube bundle and the shrouds. With different gaps through the tube bundle height, the helium flow experiences different cooling effects from the tube bundle. Hence, the temperature distribution in the shrouds will be non-uniform circumferentially since their surrounding helium flow temperatures are varied. These non-uniform temperatures in the shrouds result in the phenomenon of thermal bowing of shrouds.

2105 Power Reactors, Breeding

REFER ALSO TO CITATION(S) 26892, 27166, 27167, 27168, 27169, 27170, 27184

27142 (CONF-810625—19) 3.6 simplified methods for design. Nickell, R.E.; Yahr, G.T. (Oak Ridge National Lab., TN (USA); Applied Science and Technology, La Jolla, CA (USA)). 1981. Contract W-7405-ENG-26. 12p. NTIS, PC A02/MF A01. Order Number DE81023934.

From ASME PVP conference; Denver, CO, USA (21 Jun 1981).

Simplified design analysis methods for elevated temperature construction are classified and reviewed. Because the major impetus for developing elevated temperature design methodology during the past ten years has been the LMFBR program, considerable emphasis is placed upon results from this source. The operating characteristics of the LMFBR are such that cycles of severe transient thermal stresses can be interspersed with normal elevated temperature operational periods of significant duration, leading to a combination of plastic and creep deformation. The various simplified methods are organized into two general categories, depending upon whether it is the material, or constitutive, model that is reduced, or the geometric modeling that is simplified. Because the elastic representation of material behavior is so prevalent, an entire section is devoted to elastic analysis methods. Finally, the validation of the simplified procedures is discussed.

27143 (CONF-810625—20) Constitutive equations for meeting elevated-temperature-design needs. Pugh, C.E.; Robinson, D.N. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 44p. NTIS, PC A03/MF A01. Order Number DE81023935.

From ASME PVP conference; Denver, CO, USA (21 Jun 1981).

Constitutive equations for representing the inelastic behavior of structural alloys at temperatures in the creep regime are discussed from the viewpoint of advances made over the past decade. An emphasis is placed on the progress that has been made in meeting the needs of the program whose design process is based in part on a design-by-inelastic-analysis approach. In particular, the constitutive equations that have been put into place for current use in design analyses are discussed along with some material behavior background information. Equations representing short-term plastic and long-term creep behaviors are considered. Trends towards establishing improved equations for use in the future are also described. Progress relating to fundamentals of continuum mechanics, physical modeling, phenomenological modeling, and implementation is addressed.

27144 (CONF-810803—6) Calculated GCFR fuel rod behavior for steady state and transient operation. Resch, S.C. (EG and G Idaho, Inc., Idaho Falls (USA)). 1981. Contract AC07-76ID01570. 7p. NTIS, PC A02/MF A01.

From Topical meeting on reactor safety aspects of fuel behavior; Sun Valley, ID, USA (2 Aug 1981).

The Idaho National Engineering Laboratory (INEL) was contracted to review the Preliminary Safety Information Document (PSID) Amendment 10 for Gas-Cooled Fast Reactors (GCFR). As part of this effort the light water reactor codes, FRAPCON-1 and FRAP-T5 were converted to model GCFR fuel rod behavior. The conversion and application of these codes for GCFR analyses is the subject of this paper.

27145 (DOE/SF/70030—T21) Chemical cleaning specification: few tube test model. Hampton, L.V.; Simpson, J.L. (General Electric Co., San Jose, CA (USA). Advanced Reactor Systems Dept.). Sep 1979. Contract AT03-76SF70030. 11p. NTIS, PC A02/MF A01. Order Number DE81024302.

The specification is for the waterside chemical cleaning of the 2 1/4 Cr - 1 Mo steel steam generator tubes. It describes the reagents and conditions for post-chemical cleaning passivation of the evaporator tubes. (DLC)

27146 (DOE/SF/71032—T14) Initial evaluations of shutdown heat removal for CDS using the GENCON code. Lunsford, D.W. (General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.). 28 Aug 1980. Contract AT03-76SF71032. 19p. NTIS, PC A02/MF A01. Order Number DE81025238.

As part of an evaluation of CDS in-vessel flow path for natural convection, a parametric study of core responses to various conditions and operations modes of a Direct Auxiliary Cooling System (DRACS) was performed using the thermal/hydraulics computer code GENCON. Several assumptions with regard to the flow diode and check valve configuration and the sequence of events leading to activation of the DRACS were introduced. Flow resistance of the DRACS primary loop was calculated based on the original check valve configuration and then varied over the range +- 80%. Two starting conditions were used: first, with the DRACS initially at its design operating temperatures, and second, with the DRACS secondary NaK loop initially at a cold condition. For both cases, a low sodium level in the reactor and zero primary system flow were assumed. Reactor scram was assumed to occur concurrently with DRACS activation. The entire core decay heat load was assumed to be dissipated through three of the four DRACS loops. Plots of average core outlet temperature versus time show increasing peak temperature as flow resistance increases and also increased peak temperature when starting from the cold condition. Peak core outlet temperatures were in the range of 1350 to 1550°F.

27147 (HEDL—6937) Fast Flux Test Facility (FFTF) maintenance provisions. Marshall, J.L. (Hanford Engineering Development Lab., Richland, WA (USA)). May 1981. Contract AC14-76FF02170. 34p. NTIS, PC A03/MF A01. Order Number DE81026192.

The Fast Flux Test Facility (FFTF) was designed with maintainability as a primary parameter, and facilities and provisions were designed into the plant to accommodate the maintenance function. This paper describes the FFTF and its systems. Special maintenance equipment and facilities for performing maintenance on radioactive components are discussed. Maintenance provisions

designed into the plant to enhance maintainability are also described.

27148 **(LA—8873-PR) Examination of fast-reactor fuels and FBR analytical quality-assurance standards and methods. Progress report, January 1-March 31, 1981.** Maraman, W.J. (comp.). (Los Alamos National Lab., NM (USA)). Jun 1981. Contract W-7405-ENG-36. 9p. NTIS, PC A02/MF A01. Order Number DE81026857.

The examination and comparison of the effects of neutron irradiation on Liquid Metal Fast Breeder Reactor (LMFBR) Program fuel materials are studied. Unirradiated and irradiated materials will be examined as requested by the Reference Fuels System Branch of the Division of Reactor Research and Technology (DRRT). Capabilities have been established and are being expanded for providing conventional preirradiation and postirradiation examinations. Reliable chemical characterizations are essential to the development of high-quality fuels, control rods, and other reactor components in the FBR Program. The objective tasks are designed to assure the quality of the chemical characterizations used to evaluate reactor components relative to specifications. A new task is developing procedures for preparing uranium oxide pellets containing characterized levels of various components for use as quality assurance materials in the Secure Automated Fabrication (SAF) facility being constructed at the Hanford Engineering Development Laboratory (HEDL).

27149 **(LA-UR—81-1937) Loss-of-bond test of sodium-bonded LMFBR (U,Pu)-carbide fuel elements.** Petty, R.L.; Latimer, T.W. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 13p. (CONF-810803—7). NTIS, PC A02/MF A01. Order Number DE81025370.

From Topical meeting on reactor safety aspects of fuel behavior; Sun Valley, ID, USA (2 Aug 1981).

Nine sodium-bonded (U,Pu)-carbide fuel elements were irradiated in EBR-II to simulate, and to assess the consequences of, a loss-of-sodium-bond event during irradiation. Each element contained a bond-voiding device that was designed to eject the bond sodium into an evacuated reservoir when operating power was reached. The test matrix included elements that contained both shrouded and unshrouded fuel columns; two different power levels were also included in the experiment. Two elements were removed after ~ 40 hours of irradiation; the remainder continued to operate to ~ 3 at % burnup. Results of both the short-term and the goal-burnup examinations are presented which indicate that sodium-bond loss will not jeopardize the safe operation of sodium-bonded carbide fuel elements.

27150 **(NP—25267) Fermi-1: microfilm record of the design, construction, and operation [index only].** (Atomic Power Development Associates, Inc., Detroit, MI (USA)). Feb 1981. 306p. TIC. Order Number DE81903709.

The contents of 34 file cabinets of information on this project have been placed on 16mm film and aperture cards in two stages. The first 27 file cabinets are indexed to 92 rolls of film and 2700 aperture cards. Partial contents include: the records of the Reactor Analysis Division; Technical Assistance to PROC Reactor - Fermi incident investigation; reactor subassemblies; large fast reactor design study; cask car; reactor vessel, shielding and containment; inspection surveys; electrical and instrumentation; reactor control elements; and APDA company files. A second group, the contents of 7 file cabinets are indexed to 22 rolls of film and 1400 aperture cards. In this group the aperture cards are keyed to the file cabinet drawer number. Partial contents include the APDA specifications on reactor components, systems layouts, instrumentation, props, component assembly, and valves.

27151 **(PNL-TR—412) Data necessary for the simplified neutronic calculation of the first three cycles of the Phenix core.** Carnoy, M.; Robin, M.; Sicard, B. (Battelle Pacific Northwest Labs., Richland, WA (USA)). May 1981. Translation of CEA, Technical Note: SPNR/LSRCy 79/2533, 7 March 1979. (DOE/CEA/BMFT—3). 23p. NTIS, PC A02/MF A01.

The main data necessary for the simplifed calculation of the Phenix core for the first 3 operating cycles are summarized. The experimental values corresponding to the analyses of irradiated fuel in the internal zone are calculated.

27152 **Wear and corrosion performance of metallurgical coatings in sodium.** Farwick, D.G.; Johnson, R.N. (Hanford Eng Dev Lab, Richland, Wash). *Thin Solid Films ;* **73**: No. 1, 145-153(3 Nov 1980).

The friction, wear and corrosion performance is reviewed of several metallurgical coatings in sodium in the temperature range 200-650/degree/C. The tests included friction, wear, corrosion, thermal cycling, self-welding and irradiation exposure under service conditions which were as near as possible to those in the prototype breeder reactor. The materials tested were coatings of various refractory metal carbides in metallic binders, nickel-base and cobalt-base alloys and intermetallic compounds such as aluminides and borides. The coating processes evaluated included plasma spraying, detonation gun, sputtering, spark deposition and solid state diffusion. 6 refs.

27153 **Federal policies and programs in support of the nuclear breeder reactor.** Cunningham, G.W. (Department of Energy, Washington, DC). *AIChE (American Institute of Chemical Engineers) Symposium Series ;* **75**: No. 191, 6-7(1979).

Information is presented concerning President Carter's Administration policy on nuclear power; the rationale of the Administration's policy; implementation of the policy; the LMFBR; and fuel cycles.

2106 Power Reactors, Auxiliary, Mobile, Package, And Transportable

27154 **(BNL—29582) Applications of power beaming from space-based nuclear power stations.** Powell, J.R.; Botts, T.E.; Hertzberg, A. (Washington Univ., Seattle (USA). Aerospace Research Lab.; Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 8p. (CONF-810812—27). NTIS, PC A02/MF A01. Order Number DE81025078.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

Power beaming from space-based reactor systems is examined using an advanced compact, lightweight Rotating Bed Reactor (RBR). Closed Brayton power conversion efficiencies in the range of 30 to 40% can be achieved with turbines, with reactor exit temperatures on the order of 2000°K and a liquid drop radiator to reject heat at temperatures of ~ 500°K. Higher RBR coolant temperatures (up to ~ 3000°K) are possible, but gains in power conversion efficiency are minimal, due to lower expander efficiency (e.g., a MHD generator). Two power beaming applications are examined - laser beaming to airplanes and microwave beaming to fixed ground receivers. Use of the RBR greatly reduces system weight and cost, as compared to solar power sources. Payback times are a few years at present prices for power and airplane fuel.

27155 **(LA-UR—81-1042(Rev.)) Development of space reactor core heat pipes.** Meier, K.L.; Martinez, H.E.; Runyan, J.E. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 7p. (CONF-810812—12). NTIS, PC A02/MF A01.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

The Space Power Advance Reactor (SPAR) core heat pupes are being developed to transport 15 kW of power at 1400 K. A straight, 2-m-long, 15.9-mm-diam heat pipe was fabricated of low-carbon arc-cast molybdenum and filled with sodium as the working fluid. This nonconcentric, annular, screen-tube-wick pipe was tested successfully at 16.1 kW at 1310 K, at which point a boiling limit was encountered. Follow-on work has produced an as yet untested heat pipe which has its wick centered in the evaporator by spacer wires to alleviate the boiling limit problem. A dual artery wick heat pipe is being fabricated to further improve on the boiling limit and increase redundancy. Because the heat pipe must bend around the radiation shield of the SPAR reactor, a series of bending experiments was performed. Promising results were achieved by filling the pipe completely with sodium and bending at 365° K.

27156 **(LA-UR—81-1612) Compact, efficient thermoelectric module for a space reactor.** Fly, G. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 7p. (CONF-810812—15). NTIS, PC A02/MF A01.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

The thermoelectric module for the Space Reactor (SPAR) program is a compact annular unit that provides high heat fluxes with a minimum of heat losses. All interfaces are fully bonded to minimize extraneous temperature drops. In order to reduce stresses within the module, the thermoelectric material is circumferentially segmented and a radial stress relief member is provided. An enhanced silicon-germanium material allows high temperature operation and provides a high figure-of-merit. By using a titanium silicate sublimation coating, the hot junction temperature can be increased further. Thus, a module with reasonably high thermoelectric efficiency, high reliability, and low weight is produced. Since 66 of these thermoelectric ring modules comprise a generator, and 90 generators make up the SPAR conversion system, adequate redundancy is also provided.

2108 Economics

REFER ALSO TO CITATION(S) 27183

27157 **(DOE/ET/33020—2) Phase II final report and second update of the energy economic data base (EEDB) program. Volume 1 of 1.** (United Engineers and Constructors, Inc., Philadelphia, PA (USA)). Apr 1981. Contract AC02-78ET33020. 421p. (UEC-DOE—810430). NTIS, PC A18/MF A01. Order Number DE81025542.

The Energy Economic Data Base (EEDB) Program deals with the development of cost data for nuclear and comparison electric power generating stations. The objective of the USDOE EEDB Program is to provide periodic updates of technical and cost (capital, fuel and operating and maintenance) information of significance to the US Department of Energy. This information is intended to be used by USDOE in evaluating and monitoring US Civilian nuclear power programs, and to provide them with a consistent means of evaluating the nuclear option against alternatives. This report presents the Second Update of the EEDB for a cost and regulation date of January 1, 1979, prepared during Phase II of the EEDB Program. The Second Update is the first of a series of periodic updates marking the beginning of the next step in meeting the objective of the EEDB Program.

22 NUCLEAR REACTOR TECHNOLOGY

2204 Control Systems

27158 **(ALO—139) Disturbance analysis and surveillance system scoping and feasibility system. Final report.** Dowling, E.F.; Benedict, B.J.; Snidow, N.L. (Babcock and Wilcox Co., Lynchburg, VA (USA)). May 1981. Contract AC04-76DP00789. 604p. (BAW—1632). NTIS, PC A99/MF A01. Order Number DE81026657.

This report summarizes the results of a disturbance analysis and surveillance system (DASS) scoping and feasibility study conducted by The Babcock and Wilcox Company, Burns and Roe, Incorporated, General Physics Corporation, and Duke Power Company for Sandia Laboratories and the US Department of Energy. The report addresses selection of DASS goals and functions, development of a design concept for a DASS based on monitoring the nuclear plant subsystem functions and states against predetermined targets, and creation of engineering procedures for the design and implementation of a DASS. The validity of the procedures is evaluated based on application to a subset of the DASS functions. It is concluded that the DASS design concept is a feasible, systematic, and modular approach to plant disturbance identification.

2206 Research, Test, And Experimental Reactors

REFER ALSO TO CITATION(S) 27148, 27164

27159 **(ANL/RERTR/TM—2) Study of UO_2 wafer fuel for very high-power research reactors.** Hsieh, T.C.; Jankus, V.Z.; Rest, J.; Billone, M.C. (Argonne National Lab., IL (USA)). Nov 1980. Contract W-31-109-ENG-38. 32p. NTIS, PC A03/MF A01. Order Number DE81026501.

The Reduced Enrichment Research and Test Reactor Program is aimed at reducing fuel enrichment to $< 20\%$ in those research and test reactors presently using highly enriched uranium fuel. UO_2 caramel fuel is one of the most promising new types of reduced-enrichment fuel for use in research reactors with very high power density. Parametric studies have been carried out to determine the maximum specific power attainable without significant fission-gas release for UO_2 wafers ranging from 0.75 to 1.50 mm in thickness. The results indicate that (1) all the fuel designs considered in this study are predicted not to fail under full-power operation up to a burnup of 1.09×10^{21} fis/cm^3; (2) for all fuel designs, failure is predicted at approximately the same fuel centerline temperature for a given burnup; (3) the thinner the wafer, and wider the margin for fuel specific power between normal operation and increased-power operation leading to fuel failure; (4) increasing the coolant pressure in the reactor core could improve fuel performance by maintaining the fuel at a higher power level without failure for a given burnup; and (5) for a given power level, fuel failure will occur earlier at a higher cladding surface temperature and/or under power-cycling conditions. 12 figures, 7 tables.

27160 **(HEDL-SA—2314-FP) Fast Flux Test Facility.** Munn, W.I. (Hanford Engineering Development Lab., Richland, WA (USA)). 1981. Contract AC14-76FF02170. 9p. (CONF-810699—2). NTIS, PC A02/MF A01. Order Number DE81024114.

From Society of Women Engineers 1981 national convention; Anaheim, CA, USA (24 Jun 1981).

The Fast Flux Test Facility (FFTF), located on the Hanford site a few miles north of Richland, Washington, is a major link in the chain of development required to sustain and advance Liquid Metal Fast Breeder Reactor (LMFBR) technology in the United States. This 400 MWt sodium cooled reactor is a three loop design, is operated by Westinghouse Hanford Company for the US Department of Energy, and is the largest research reactor of its kind in the world. The purpose of the facility is three-fold: (1) to provide a test bed for components, materials, and breeder reactor fuels which can significantly extend resource reserves; (2) to produce a complete body of base data for the use of liquid sodium in heat transfer systens; and (3) to demonstrate inherent safety characteristics of LMFBR designs.

27161 **(LA—8762-MS) Los Alamos Critical Assemblies Facility.** Malenfant, R.E. (Los Alamos Scientific Lab., NM (USA)). Jun 1981. Contract W-7405-ENG-36. 12p. NTIS, PC A02/MF A01. Order Number DE81026805.

The Critical Assemblies Facility of the Los Alamos National Laboratory has been in existence for thirty-five years. In that period, many thousands of measurements have been made on assemblies of ^{235}U, ^{233}U, and ^{239}Pu in various configurations, including the nitrate, sulfate, fluoride, carbide, and oxide chemical compositions and the solid, liquid, and gaseous states. The present complex of eleven operating machines is described, and typical applications are presented.

27162 **(PNL—3313) Summary of experimental data for critical arrays of water moderated Fast Test Reactor fuel.** Durst, B.M.; Bierman, S.R.; Clayton, E.D.; Mincey, J.F.; Primm, R.T. III. (Battelle Pacific Northwest Labs., Richland, WA (USA); Oak Ridge National Lab., TN (USA)). May 1981. Contract AC06-76RL01830. 123p. (ORNL/Sub—81/97731/1). NTIS, PC A06/MF A01. Order Number DE81025913.

A research program, funded by the Consolidated Fuel Reprocessing Program (CFRP) of Oak Ridge National Laboratory (ORNL), was initiated at Battelle Pacific Northwest Laboratory (PNL) to acquire experimental data on heterogeneous water moder-

ated arrays of Fast Test Reactor (FTR) fuel pins. The objective of this program is to provide critical experiment data for validating calculational techniques used in criticality assessments of reprocessing equipment containing FTR-type fuels. Consequently, the experiments were designed to permit accurate definition in Monte Carlo computer codes currently used in these assessments. Square and triangular pitched lattices of fuel have been constructed under a variety of conditions covering the range from undermoderated to overmoderated arrays. Experiments were conducted composed of arrays which were water reflected, partially concrete reflected, and arrays with interspersed solid neutron absorbers. The absorbers utilized were Boral, and cadmium plates and gadolinium cylindrical rods. Data from non-CFRP sponsored subcritical experiments (previously performed at Hanford) also are included.

2209 Reactor Safety

REFER ALSO TO CITATION(S) 27545

27163 (CONF-810604—5) Behavior of graphite during rapid depressurization. Eatherly, W.P.; Beavan, L.A. (Oak Ridge National Lab., TN (USA); General Atomic Co., San Diego, CA (USA)). 1981. Contract W-7405-ENG-26. 2p. NTIS, PC A02/MF A01. Order Number DE81024251.

From 15. biennial conference on carbon; Philadelphia, PA, USA (22 Jun 1981).

Three grades of graphite used in the HTGR were subjected to depressurization rates of greater than 6500 psi/sec. All of the graphites survived the rapid depressurization with no outward signs of change. Examination of the graphites by NDE also indicated no effects of the depressurization on density or flaw distribution with the possible exception of one sample of grade 2020.

27164 (CONF-810803—1) PWR fuel behavior: lessons learned from LOFT. Russell, M.L. (Idaho National Engineering Lab., Idaho Falls (USA)). 1981. Contract AC07-76ID01570. 7p. (CONF-8010103—7). NTIS, PC A02/MF A01.

From Topical meeting on reactor safety aspects of fuel behavior; Sun Valley, ID, USA (2 Aug 1981).

A summary of the experience with the Loss-of-Fluid Test (LOFT) fuel during loss-of-coolant experiments (LOCEs), operational and overpower transient tests and steady-state operation is presented. LOFT provides unique capabilities for obtaining pressurized water reactor (PWR) fuel behavior information because it features the representative thermal-hydraulic conditions which control fuel behavior during transient conditions and an elaborate measurement system to record the history of the fuel behavior.

27165 (CONF-810803—5) FRAP-T5 uncertainty study of five selected accidents and transients. Laats, E.T. (EG and G Idaho, Inc., Idaho Falls (USA)). 1981. Contract AC07-76ID01570. 6p. NTIS, PC A02/MF A01.

From Topical meeting on reactor safety aspects of fuel behavior; Sun Valley, ID, USA (2 Aug 1981).

The FRAP-T5 transient fuel rod behavior code, with its automated uncertainty analysis subcode, was used to estimate the uncertainty of best estimate calculations simulating five selected reactor accident and transient events. Code input was supplied by the four US reactor vendors. Response surface methodology was used to estimate calculation uncertainty. Fifteen fuel rod design, model, and operation parameters were perturbed in this study. The uncertainty of both rod thermal and mechanical performance was examined.

27166 (DOE/SF/70030—T20) Effectiveness of various leak-protection systems as initiators of automatic shutdown. Magee, P.M. (General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.). Nov 1980. Contract AT03-76SF70030. 69p. NTIS, PC A04/MF A01. Order Number DE81025246.

It is concluded that an acoustic system offers the best possibility for development as an intermediate leak protection/automatic shutdown system. There are two candidate acoustic systems: a low frequency system being developed by General Electric, and a high frequency system being developd by Atomics International with support from Argonne National Laboratory. In addition, a rapid response chemical leak detection system could be effective if the design goal for response time can be increased from 20 seconds to approximately one minute.

27167 (DOE/SF/70030—T22) Evaluation of LLTR Series II Test A-3 results. Amos, J.C.; Chen, K.; Meyer, R.A.; Odegaard, T.K.; Whipple, J.C. (General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.). Nov 1980. Contract AT03-76SF70030. 99p. NTIS, PC A05/MF A01. Order Number DE81025244.

Of the five secondary tubes failed in Test A-3, two were failed by impingement wastage, and the other three appear to have been caused by overheating possibly augmented by wastage. Since no secondary tube failures occurred during large leak tests, this spports the hypthesis that a small initial leak can create much more damage on neighboring tubes than an initial large leak. The overheating falures occurred in about 20 seconds after a second large hole had been produced in a thin wall (non-prototypical) primary tube. Continued water injection under static or low sodium flow conditions following an initial small leak will produce high temperatures which can result in deformation (bowing) of 2-1/4 Cr-1 Mo steam tubes and interference at the tube-tubespacer interface. The damage caused by either impingement wastage or overheating will occur at or above the elevation plane of the initial leak. If water/steam injection continues after removal of the sodium, water steam blanketing will cool the tubes heated by the SWR. Additional tube failures can be caused by overheating prior to rupture disc operation when leak rate is increased by secondary tube penetrations caused by wastage. Acoustic emission measurement provides a rapid means of leak detection for intermediate size leaks.

27168 (DOE/SF/71032—T12) Nature, analysis, and impact of common-cause failures on the design and licensing of future LBRs. Jacobs, I.M. (General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.). Aug 1980. Contract AT03-76SF71032. 52p. NTIS, PC A04/MF A01.

Several attempts have been made to include the impact of Common Cause Failures within the quantitative reliability model, but, for the most part, the models have not been adequately validated and lack data to support them. This leaves the designer of a new system in a quandary as to what methods to use to assess the design. This paper advocates that reducing and controlling the impact of defects or events referred to as Common Cause Failures is more important than measuring or modeling - especially so since measuring has not been reduced to practice. Therefore, the preferred approach in addressing CCF problems for LBRs is to proceed along the lines of a simple three-prong attack: (1) make modifications during the early stages of design to include as many diverse defenses against the intrusion of Common Cause Failures as practicable; (2) prepare a good mathematical model of the system including al identifiable causes of failure; and (3) advance qualitative arguments that the overall reliability is adequate.

27169 (DOE/SF/71032—T13) Self-actuated shutdown-system development: system response-analysis status. Deane, N.A.; Gregoire, K.E.; Tatsumi, J.T. (General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.). Sep 1980. Contract AT03-76SF71032. 8p. NTIS, PC A02/MF A01. Order Number DE81025239.

This report provides a preliminary evaluation of the SASS response time requirements for the safe shutdown earthquake (SSE), the flow coastdown (FCD), and two transient overpower (TOP) events. The driving functions for the SSE are a 20 cent step reactivity insertion with a +- 60 cent oscillation super imposed for 10 seconds combined with a flow coastdown defined by F/F/sub (0)/ = 1/(1+.2788t). The driving function of the FCD is just the relative flow curve defined above for the SSE. The TOP event driving function represents a control rod runout to a total of 60 cents at ramp rates of .76 cents/s and 6.1 cents/s. 3 figures.

27170 (DOE/SF/71032—T16) Sparging test. Dayan, A.; Huang, T.; Teresi, J.; Gluekler, E.L. (General Electric Co., Sunnyvale, CA (USA). Energy Systems and Technology Div.). 1978. Contract AT03-76SF71032. 8p. NTIS, PC A02/MF A01. Order Number DE81025243.

For postulated LMFBR core disruptive accidents, there is a need to evaluate the radiological source term, including releases of solid particles and gases from the boiling sodium pool. In the proposed sparging test, an argon injection into a sodium pool would be used to simulate both boiling conditions and gases released into the pool from the reactor cell floor following the heating of the concrete and chemical interactions. Cerium oxide particles would be used to simulate UO_2 particles. (DLC)

27171 **(EGG-PHYS—5298) Physics calculations for the RIA 1-3 irradiated rod test.** Young, T.E. (EG and G Idaho, Inc., Idaho Falls (USA)). Jun 1981. Contract AC07-76ID01570. 44p. NTIS, PC A03/MF A01. Order Number DE81025763.

The RIA 1-3 test would employ a square array of four preirradiated BWR rods to provide information on fuel failure modes and consequences of postulated Reactivity Initiated Accidents in power reactors. Calculations were done to: (1) predict R-O power distributions in the test rods for thermal-hydraulic and fuel-failure analysis; and (2) predict the steady-state and transient ratios of test fuel energy deposition to core energy deposition (Figures of Merit). Fission distributions for the test were computed with the RAFFL Monte Carlo code using an external neutron current source from a complete-reactor radial calculation with the SCAMP S/sub n/ code. Energies per fission for the rods were computed using the SINBAD buildup and depletion code, the GAMSOR gamma ray source code, and the QAD-BSA point-kernel shielding code. The calculated rod average-to-test average energy deposition ratios are 0.99, 0.99, and 0.97 for the rods irradiated to approximately 12 CWd/tu, and 1.04 for the rod irradiated to 4.8 GWd/tu. The maximum deviation of the power density of 1/12-rod azimuthal segments from the rod average is 4%. For an estimated control rod position of 0.591 m withdrawn the predicted radial average energy deposition at the axial peak in an average test rod is 1.71 (kW/m)/MW during preconditioning, and 1.84 (kJ/kg UO_2) MW.S during the burst. 16 figures, 7 tables.

27172 **(GEND—004) Quick look report, entry 4: Three Mile Island Unit 2, November 13, 1980.** Eidam, G.E. (EG and G Idaho, Inc., Idaho Falls (USA)). Jun 1981. Contract AC07-76ID01570. 32p. NTIS, PC A03/MF A01. Order Number DE81023966.

This report summarizes tasks performed during entry 4 at Three Mile Island Unit 2. During the entry into containment, which was made on November 13, 1980, additional beta and gamma surveys were conducted to supplement data acquired on previous entries. A decontamination test was completed on Elevation 305. Power receptables tested on Elevation 305 were deenergized, but receptacles on Elevation 347 were energized. Still photography was acquired of Elevations 305 and 347. During the entry, 86 still photographs were taken. Videotaping (color and black and white) was done on Elevations 305 and 347, but lighting on both elevations was insufficient for high-quality video.

27173 **(LA-UR—80-3178) TRAC-PD2 analysis of FLECHT experiments.** Bott, T.F.; Mandell, D.A. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 23p. (CONF-810804—1). NTIS, PC A02/MF A01.

From National heat transer conference; Milwaukee, WI, USA (2 Aug 1981).

This report describes TRAC-PD2 calculations of FLECHT (Full Length Emergency Cooling Heat Transfer) tests 4831 and 17201. The calculations were performed as part of the TRAC-PD2 developmental assessment where the objective was to assess TRAC-PD2 reflood modeling under forced flooding conditions. Calculated and experimental values for peak fuel-rod clad temperature, clad quenching time, and rod bundle effluent rates are compared; and calculations with an approximate radiation heat-transfer model added to the basic TRAC-PD2 code are performed. Findings demonstrate the potential importance of surface-to-surface radiation heat transfer in these tests.

27174 **(LA-UR—81-1685) Coordinated experimental/analytical program for investigating margins to failure of Category I reinforced concrete structures.** Endebrock, E.; Dove, R.; Anderson, C.A. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 35p. (CONF-810801—50). NTIS, PC A03/MF A01. Order Number DE81025382.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

The material presented in this paper deals with a coordinated experimental/analytical program designed to provide information needed for making margins to failure assessments of seismic Category I reinforced concrete structures. The experimental program is emphasized and background information that lead to this particular experimental approach is presented. Analytical tools being developed to supplement the experimental program are discussed. 16 figures.

27175 **(PNL—3687) Reactor-vessel-sectioning demonstration.** Lundgren, R.A. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jul 1981. Contract AC06-76RL01830. 23p. NTIS, PC A02/MF A01. Order Number DE81026327.

A successful technical demonstration of simulated reactor vessel sectioning was completed using the combined techniques of air arc gouging and flame cutting. A 4-ft x 3-ft x 9-in. thick sample was fabricated of A36 carbon steel to simulate a reactor vessel wall. A 1/4-in layer of stainless steel (SS) was tungsten inert gas (TIG)-welded to the carbon steel. Several techniques were considered to section the simulated reactor vessel: an air arc gouger was chosen to penetrate the stainless steel, and flame cutting was selected to sever the carbon steel. After the simulated vessel was successfully cut from the SS side, another cut was made, starting from the carbon steel side. This cut was also successful. Cutting from the carbon steel side has the advantages of cost reduction since the air arc gouging step is eliminated and contamination controlled because the molten metal is blown inward.

27176 **(SAND—80-2558C) Fuel relocation following LWR core uncovering: models and uncertainties.** Rivard, J.B. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 8p. (CONF-810803—2). NTIS, PC A02/MF A01.

From Topical meeting on reactor safety aspects of fuel behavior; Sun Valley, ID, USA (2 Aug 1981).

Meltdown sequences in Light Water Reactors (LWRs) were treated in the Reactor Safety Study with the objective of quantifying the risk associated with their occurrence. Recent studies have focused on the analysis of severe Pressurized Water Reactor (PWR) accident sequences to identify possible accident mitigation strategies and measures. As part of this recent work, the capabilities for modeling the in-vessel meltdown scenarios were reviewed, and significant uncertainties were identified. Subsequent effort, partially reported herein, has sought to reduce the uncertainties in the analysis and provide a firmer basis for accident management.

27177 **(SAND—81-0322C) RELAP4 calculations of small break LOCAS in PWRs equipped with upper-head injection.** LaChance, J.L.; Berman, M. (Sandia National Labs., Albuquerque, NM (USA); Energy, Inc., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 10p. (CONF-810806—1). NTIS, PC A02/MF A01.

From Conference on small break loss of coolant accident analysis in LWR's; Monterey, CA, USA (25 Aug 1981).

The Upper Head Injection (UHI) System is designed to inject directly into the upper head region of the reactor at 1300 psi during a postulated Loss-of-Coolant Accident (LOCA). Recently, some small break LOCA analyses were performed with specially modified versions of RELAP4/MOD5 created to evaluate large break LOCAs in UHI plants. This paper compares some of the small break RELAP4 results with results from similar Westinghouse calculations performed with the WFLASH code. The effects of the special models installed in RELAP4/MOD5 on UHI plant small break LOCA analyses are also evaluated. The calculations simulated 4- and 6-inch diameter cold leg breaks and a break in one of the 4-inch diameter UHI injection lines.

27178 **(SAND—81-0352C) Modeling and conduct of turbine missile concrete impact experiments.** Woodfin, R.L.; Sliter, G.E. (Sandia National Labs., Albuquerque, NM (USA); Electric Power Research Inst., Palo Alto, CA (USA)). 1981. Contract AC04-76DP00789. 8p. (CONF-810801—13). NTIS, PC A02/MF A01. Order Number DE81012661.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

Four full scale experiments were conducted from December 19, 1979 to June 12, 1980. This paper describes the derivation of the test matrix and the method of conducting the experiments. Three missile quantitites were varied: mass, velocity, and attitude (the piercing or blunt nature of the impact). One wall property, the presence or absence of a steel liner plate, was varied.

27179 **(UCRL—84882) Description of steam condensation phenomena during the loss-of-coolant accident.** McCauley, E.W.; Holman, G.S.; Aust, E.; Furst, H.; Schwan, H.; Vollbrandt, J. (Lawrence Livermore National Lab., CA (USA); GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht G.m.b.H., Hamburg (Germany, F.R.)). Jan 1981. Contract W-7405-ENG-48. 13p. (CONF-810801—1). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

Study of results from the full scale multivent pressure suppression experiment conducted by the GKSS Laboratory has developed an improved understanding of the dynamic, oscillatory steam condensation events and related loading functions which occur during the hypothetical loss-of-coolant accident in a boiling water nuclear reactor. Due to the unique measurements systems which combines both cinematic and digital data, qualified correlation between the dynamic physical variables and the associated two-phase thermo-hydraulic phenomena has been obtained.

27180 **(UCRL—84882(Summ.)) Description of steam-condensation phenomena during the loss-of-coolant accident.** McCauley, E.W.; Holman, G.S.; Aust, E.; Schwan, H.; Vollbrandt, J.; Fuerst, H. (Lawrence Livermore National Lab., CA (USA); Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 28 Aug 1980. Contract W-7405-ENG-48. 4p. (CONF-810801—1(Summ.)). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

The development and verification of advanced computer models which describe the boiling water reactor (BWR) pressure suppression process for a hypothetical loss-of-coolant accident (LOCA) require a clear description of basic steam condensation phenomena. The GKSS Research Center, in coordination with interested institutions of West Germany and the United States, is currently conducting a test program for such basic research on a multivent BWR-related pressure suppression system. The Lawrence Livermore National Laboratory (LLNL) acts as the principal US NRC liaison for this test program, with particular emphasis on development of GKSS data for confirmatory use regarding US Mark II nuclear power plants as well as to advanced code development. The multivent test facility, placed in operation in February 1979, is a three-pipe full-scale vent system modelling main features of both the West German KWU and United States G.E. Mk II BWR pressure suppression systems. The test facility and testing programs are described.

27181 **(UCRL—84883(Summ.)) Effect of non-heterogeneous wetwell boundaries on pressure suppression system response.** McCauley, E.W.; Holman, G.S.; Namatame, K.; Kukita, Y.; Shiba, M. (Lawrence Livermore National Lab., CA (USA); Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment). 29 Aug 1980. Contract W-7405-ENG-48. 7p. (CONF-810801—2(Summ.)). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

The Full-Scale Mark II CRT (Containment Response Test) Program is in progress at the Tokai-Mura Establishment of the Japan Atomic Energy Research Institute (JAERI). The primary objective of the on-going CRT Program is to provide a data base for evaluation of the pressure suppression pool (wetwell) hydrodynamic loads associated with a postulated loss-of-coolant accident (LOCA) in the BWR Mark II containment system. The test facility is 1/18 of full scale in volume and has a wetwell which is a full-scale geometric replica of one 20°-sector of a reference 1100MWe Mark II.

27182 **(UCRL—84887) Improved fluid-structure coupling.** McMaster, W.H.; Gong, E.Y.; Landram, C.S. (Lawrence Livermore National Lab., CA (USA)). Jan 1981. Contract W-7405-ENG-48. 9p. (CONF-810801—36). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

In the computer code PELE-IC, an incompressible Eulerian hydrodynamic algorithm was coupled to a Lagrangian finite element shell algorithm for the analysis of pressure suppression in boiling water reactors. This effort also required the development of a free surface algorithm capable of handling expanding gas bubbles. These algorithms have been improved to strengthen the coupling and to add the capability for following the more complex free surfaces resulting from steam condensation. These improvements have also permitted more economical 2D calculations and have made it feasible to develop a 3D version. A compressible option using the acoustic approximation has also been added, furthering the usefulness of the code. The coupling improvements were made in three areas which are identified as (1) preferential coupling, (2) merged cell coupling, and (3) free surface-structure coupling, and are described. These algorithms have been additionally implemented in a three dimensional version of the code called PELE3D. This version has a free surface capability to follow expanding and contracting bubbles and is coupled to a curved rigid surface.

27183 **Nuclear construction quality assurance systems.** Burati, J.L.; Thomas, H.R. Jr.; Willenbrock, J.H. (Clemson Univ, SC). *Journal of the Construction Division, Proceedings of the ASCE (American Society of Civil Engineers)* ; **107**: No. 2, 349-360(Jun 1981).

Practices implemented on nuclear power plant construction projects to assure acceptable construction quality are presented and discussed. The highly active role of the Federal government in the nuclear construction process in presented in detail. Quality assurance requirements imposed by the Nuclear Regulatory Commission are also discussed. Various organizational structures and quality assurance programs which have developed in response to Federal requirements are presented and compared. Various levels of owner (utility) involvement in the quality assurance of design and construction activities are compared, and reasons are cited for the trend toward increased owner involvement in quality assurance activities. Federal requirements for objective evidence of quality and the tremendous volumes of documentation which have resulted are also considered. 4 refs.

27184 **Structural response of 1/20-scale models of the CRBR to a simulated HCDA.** Romander, C.M. (SRI International, Menlo Park, CA (USA)); Cagliostro, D.J. (Los Alamos Scientific Lab., NM (USA)). *Nuclear Engineering and Design* ; **60**: No. 2, 239-256(Sep 1980).

The structural integrity of scale models of the Clinch River Breeder Reactor (CRBR) vessel and head under a simulated hypothetical core disruptive accident (661 MWs) is evaluated experimentally. Tests of three 1/20-scale models of the CRBR, each of increasing complexity, showed the effects of the upper internals structure (UIS), a thermal liner, and other structural details on vessel and head response. A fourth model, identical to the most complex model but with more instrumentation, demonstrated experimental reproducibility. Ni 200 simulated 304 SS, the material used to fabricate the fullscale vessel wall, core barrel, and core support platform; water simulated liquid sodium; and the detonation products of a low-density explosive simulated the HCDA core loads. Loading pressures, strains, and accelerations were measured.

25 ENERGY STORAGE

REFER ALSO TO CITATION(S) 26988

2501 Magnetic

27185 **(LA-UR—81-1902) Microcomputer control for the superconducting magnetic energy storage system.** Seamons, M.J.; Criscuolo, A.L. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 9p. (CONF-810623—9). NTIS, PC A02/MF A01. Order Number DE81025333.

From 24. midwest symposium on circuits and systems; Albuquerque, NM, USA (29 Jun 1981).

The microcomputer-based, automatic control and data acquisition system for the Superconducting Magnetic Energy Storage system is described. A brief discussion of the function of SMES and identification of its major systems is followed by a detailed discussion of the control and data acquisition system. The distributed control and data acquisition architecture, interprocessor timing and communications, task scheduler, master-slave relationship, and man/machine interface are some of the topics discussed.

27186 **(LA-UR—1535) 30-MJ superconducting magnetic energy storage for electric-transmission stabilization.** Turner, R.D.; Rogers, J.D. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 6p. (CONF-810812—13). NTIS, PC A02/MF A01.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

The Bonneville Power Administration operates the electric power transmission system that connects the Pacific Northwest and southern California. The HVAC interties develop 0.35 Hz oscillations when the lines are heavily loaded. A 30 MJ (8.4 kWh) Superconducting Magnetic Energy Storage (SMES) unit with a 10 MW converter can provide system damping for the oscillation. The unit is scheduled for installation in 1982 and operation in 1982-83. Status of the project is described. The conductor has been fully tested electrically and mechanically and the 5 kA superconducting cable has been produced. The 30 MJ superconducting coil is essentially complete. All major components of the electrical and cryogenic systems except the nonconducting dewar have been completed. The refrigerator and converter are undergoing tests. The system is to be located at the BPA Tacoma Substation and operated by microwave link from Portland, OR.

2502 Compressed Gas

REFER ALSO TO CITATION(S) 27187

2503 Pumped Hydro

27187 **(EPRI-EM—1589(Vol.4)) Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 4. System planning studies. Final report.** (Potomac Electric Power Co., Washington, DC (USA); Acres American, Inc., Columbia, MD). Apr 1981. Contract AC02-77ET28013. 94p. NTIS, PC A05/MF A01. Order Number DE81025263.

Potomac Electric Power Company and Acres American Incorporated have been performing a three year DOE/EPRI/PEPCO sponsored program for preliminary design of water compensated Compressed Air Energy Storage (CAES) and Underground Pumped Hydroelectric (UPH) power plants. This report presents both the costs of the CAES and UPH plant designs which were developed, and the results of economic evaluations performed for the PEPCO system. The PEPCO system planning analysis was performed in parallel stages with plant design development. Analyses performed early in the project indicated a requirement for 1000 MW/10,000 MWH of energy storage on a daily operating schedule, with economic installation in two segments of 500 MW in 1990 and 1997. The analysis was updated eighteen months later near the end of the project to reflect the impact of new growth projections and revised plant costs. The revised results indicated economic installations for either UPH or CAES of approximately 675 MW/6750 MWH on a daily cycle, installed in blocks of approximately 225 MW in 1990, 1993 and 1995. Significant savings in revenue requirements and oil fuel over the combustion turbine alternative were identified for both CAES and UPH.

2505 Flywheels

REFER ALSO TO CITATION(S) 27347

27188 **(UCRL—15359) Toward optimization of the woven flywheel.** Sapowith, A.D.; Handy, W.E. (Avco Systems Div., Wilmington, MA (USA)). 1 Jun 1981. Contract W-7405-ENG-48. 8p. NTIS, PC A02/MF A01. Order Number DE81026568.

Avco's constant stress composite flywheel incorporates fibres in the two principal stress directions: radial and circumferential. A description of this design concept, along with two basic fabrication methods, is presented. The low cost fabrication approach which incorporates a spiral weave is evaluated for its energy storage capacity. In this evaluation, several extremes of weave design are considered. It is concluded that flywheel performance depends primarily on maximizing the hoop fibre count and determining through experimentation the optimum fibre volume fraction for the composite.

2506 Thermal

REFER ALSO TO CITATION(S) 27036, 27293, 27294, 27328, 27329, 27338

27189 **(CONF-801055—) DOE thermal and chemical storage annual contractor's review meeting.** (Brookhaven National Lab., Upton, NY (USA); Courtesy Associates, Inc., Washington, DC (USA)). Mar 1981. Contract AC02-76CH00016. 363p. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

Separate abstracts were prepared for the Energy Data Base(EDB) for 60 of the 67 papers presented; seven papers were previously included in the data base. Also presented are project summary sheets for DOE research and development projects for the Thermal Energy Storage Program and the Chemical/Hydrogen Energy Storage Program. (WHK)

27190 (CONF-801055—, pp 1-2) **Overview of the Thermal Energy Storage (TES) Program.** Gurevich, M. Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The Thermal Energy Storage (TES) Program of the US Department of Energy (DOE) promotes energy savings and fuel substitution by developing and helping to commercialize technologies for storing heat or cold, with short investment payback periods as a cost goal. The sources of energy include industrial and utility waste heat as well as primary sources such as solar, geothermal, nuclear and fossil fuels. The primary source of cold for seasonal storage is winter chilled air. The DOE Thermal Energy Storage program emphasizes near-term (1980's) approaches to energy conservation and displacement of natural gas and oil. It also provides for development of technologies which will allow use of renewable resources such as solar-thermal energy during the mid-term (1990's) and advanced energy storage and transport techniques for the far-term (beyond 2000). The applications include daily storage for active or passive solar and for conventional heating and cooling, heat storage and heat transport for solar thermal electric power generation, and storage for recovery of industrial or utility waste heat.

27191 (CONF-801055—, pp 3-6) **ORNL thermal energy storage program overview.** Martin, J.F. (Oak Ridge National Lab., TN). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

Development of thermal energy storage (TES) technologies and subsystems is relevant to national energy objectives in energy conservation and in the deployment of new energy sources. Oak Ridge National Laboratory (ORNL) acts as a Lead Technical Lab-

oratory in managing for DOE-STOR those elements of the program dealing with Building Heating and Cooling and Industrial Applications. The scope of ORNL activity in these two activities is described, and a summary of each of the in-house and subcontracted projects current or anticipated for the next fiscal year is presented. The major thrust of each of the elements of the ORNL program is given.

27192 (CONF-801055—, pp 15-17) **Experimental evaluation of thermal energy storage: status report.** Hersh, H.N. (Argonne National Lab., IL). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

Thermal energy storage (TES) for space heating is a load management technique that has successfully been used in Europe. Early results from the ANL assessment of energy storage technologies indicated that customer owned TES units of the type used in Europe could provide a cost-effective means for utility load management in the US. It is only necessary, therfore, that the technical and economic viability of this technology be examined under US climatic, institutional and other conditions. In Vermont, utilities had already begun to investigate thermal energy storage and off-peak rates as one form of load management and had instituted programs to reduce loads by direct utility control of storage hot water heaters. New England, with its strong dependence on oil and scarcity of natural gas, is a regional area with a great potential market for TES and was selected as the site for the experiments reported here.

27193 (CONF-801055—, pp 18-21) **Development of an optimum process for electron beam crosslinking of high density polyethylene pellets.** Salyer, I.O.; Davison, J.E. (Univ. of Dayton Research Inst., OH). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The University of Dayton is conducting an investigation of the crosslinking of high density polyethylene by electron beam irradiation. The objective of the program is to define the optimum conditions for electron beam irradiation of the polyethylene which will produce a thermally form stable material with the optimum value for the retained enthalpy of fusion. Commercially available high density polyethylene pellets have been irradiated to total doses of 2, 4, 6, and 8 megarads in a single pass through an electron beam. Radiation doses of five to six megarads are sufficient to maintain the thermal form stability of high density polyethylene pellets. The enthalpy of fusion at these radiation doses is approximately 90% of the value of the unirradiated pellets. The melting temperature of the pellets does not change with the radiation dosage, and the pellets may be successfully irradiated in air. The irradiated pellets have been thermally cycled through their melting point for more than 100 complete cycles and have maintained an open structure that is porous to the flow of the heat transfer fluid. We expect to have completed the electron beam irradiation processing of 15,000 pounds of material for delivery to DOE for full scale application tests in August.

27194 (CONF-801055—, pp 22-23) **Thermal energy storage test facility.** Ternes, M.P. (Oak Ridge National Lab., TN). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

Two loops making up the Thermal Energy Storage Test (TEST) Facility, using either air or liquid as the thermal transport fluid, are being designed and developed. These loops will be capable of cycling residential-size thermal energy storage units through conditions simulating solar or off-peak electricity applications to evaluate the unit's performance. Construction of the liquid cycling loop has been completed, and testing of thermal stratification techniques for hot and cold water is currently underway. Four PCM TES units are on hand, with their performance testing and evaluation to begin upon the completion of the stratification studies. The detailed design of the air cycling loop will be initiated during the 1981 fiscal year.

27195 (CONF-801055—, pp 28-30) **Mathematical modeling of moving boundary problems in thermal energy storage.** Solomon, A.D. (Union Carbide Corp., Oak Ridge, TN). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

Some recent results obtained in the mathematical modeling of moving boundary problems in thermal energy storage are described. These results can be placed into three categories: (a) results of an analytical nature, including the development of approximations allowing us to predict the behavior of systems; (b) simulation development and (where possible) validation via comparisons with experiments, exact solutions to model problems and other methods; and (c) numerical analysis problems that arise from the simulation development.

27196 (CONF-801055—, pp 33-36) **Thermal energy storage testing facility.** Schoenhals, R.J.; Lin, C.P.; Kuehlert, H.F.; Anderson, S.H. (Purdue Univ., West Lafayette,IN). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

Development of a prototype testing facility for performance evaluation of electrically heated thermal energy storage units is being pursued. Laboratory apparatus and test procedures are being evaluated by means of measurements and analysis. Testing procedures have been improved, and test results have been acquired for commercially available units. A 30kW central unit and several smaller individual room-size units have been tested. This work is associated with a parallel effort by ASHRAE to establish a standard for performance evaluation of units of this type.

27197 (CONF-801055—, pp 39-43) **Olivine-based heat storage refractories.** Gay, B.M.; Palmour, H. III; Cochrane, R.L. (North Carolina State Univ., Raleigh). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

High-heat capacity refractory ceramics have been employed in European electric heat storage furnaces for over two decades. In these systems, ceramic refractories are heated to approximately 1500°F, using low-cost electric energy during the off-peak demand hours. During the peak demand hours, heat is extracted as needed by controlled circulation of air through the core to meet residential or commercial space conditioning requirements. Heat storage furnaces represent (a) valuable load-leveling capabilities for central electric utilities and (b) safe, convenient, reliable heat sources for consumers. Because of its relatively high-heat capacity and relatively low cost, olivine is one of the more attractive candidate materials for such ceramics, and North Carolina has extensive but rather under-utilized deposits of refractory grade olivine. This paper summarizes results which have been achieved to date with University and North Carolina Energy Institute funding in an evaluation of the usefulness of North Carolina olivine in ceramic refractories for thermal energy storage applications. Also included are the goals for the current DOE-funded study, along with a discussion of equipment currently being installed to facilitate more precise performance evaluations.

27198 (CONF-801055—, pp 44-46) **Performance of stratified thermal storage system for Oliver Springs Elementary School: progress report.** Reid, R.L.; Bedinger, A.F.G. (Univ. of Tennessee, Knoxville). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

A progress report is given on the performance of a stratified thermal storage system coupled with a heat recovery refrigeration machine designed to provide space heating, cooling and service water heating. Water storage tanks utilizing a flexible membrane to resist temperature blending will be used as the thermal storage element. The school is presently under construction with an expected completion date of January 1981. The two design goals of the heat recovery and thermal energy storage system are (1) to minimize the need to purchase energy for space heating and cooling and water heating and (2) to minimize electrical demand. An automatic data acquisition system will be used for system performance data gather-

ing. Manual temperature profile measurements will be made on one of the three thermal storage tanks. Data collection is expected to begin in January 1981.

27199 (CONF-801055—, pp 65-67) **Active heat exchange - system development for latent heat thermal energy storage.** Alario, J.; Haslett, R. (Gumman Aerospace Corp., Bethpage, NY). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The objective of this program is to develop an active heat exchange method in a latent heat (salt) thermal energy storage system that prevents a low conductivity solid salt layer from forming on heat transfer surfaces. An evaluation of suitable media with melting points in the temperature range of interest (250 to 400°C) limited the candidates to molten salts from the chloride, hydroxide and nitrate families, based on high storage capacity, good corrosion characteristics and availability in large quantities at reasonable cost. The specific salt recommended for laboratory tests was a choride eutectic (20.5KCL, 24.5NaCL, 55.0MgCl/sub 2%/ by wt.), with a nominal melting point of 385°C. Various active heat exchange concepts were identified from among three generic categories: scrapers, agitators/vibrators and slurries. The preferred ones were given a more detailed technical evaluation and the economics compared to a passive tube-shell design for a reference application (300 MW/ sub t/ storage for 6 hours). Test hardware was built for the two most promising concepts: (1) a direct contact heat exchanger in which molten salt droplets are injected into a cooler counterflowing stream of liquid metal carrier fluid (Lead/Bismuth) and (2) a rotating drum scraper in which molten salt is sprayed onto the circumference of a rotating drum, which contains the fluid heat sink in an internal annulus near the surface. A fixed scraper blade removes the solidified salt from the surface which has been nickel plated to decrease adhesion forces. The test evaluation has been interrupted due to funding limitations resulting from various problems with pumps, plumbing leaks and corrosion failure of electrical heaters.

27200 (CONF-801055—, pp 68-72) **1980 report on NRL energy storage program.** Chubb, T.A.; Nemecek, J.J.; Simmons, D.E.; Veith, R.J. (Naval Research Lab., Washington, DC). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The objective of the project is to develop a means for bulk storage of energy in a form capable of providing demand sensitive steam, heat, or cooling. This paper discusses salt eutectic Real systems, availability and costs of salts, the progress on the 2 MWht energy storage boiler tank now under construction at NRL, and major elements of storage system costs for this 2 MWht tank which employs a heat transfer fluid. A radiation-coupled energy storage tank concept is also discussed.

27201 (CONF-801055—, pp 73-78) **Heat storage in alloy transformations.** Birchenall, C.E. (Univ. of Delaware, Newark). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

Heat storage has been approached from four directions: (1) calorimetric measurements of heats of eutectic transformation and heat capacities of solid and liquid mixtures determined the maximum heat storage capability. New eutectics have been found and measured. This work is being written for publication; (2) volume changes during transformation and thermal expansion below and above the transformation temperature have been measured by an x-ray absorption measurement. A radioactive x-ray emitter and improvements of the furnace simplify the procedure. The measurements are nearly completed; (3) the use of graphite and carbides, successful bulk containers, as coatings to protect steels against attack by the heat storage alloys must be developed in future research; (4) heat flow models for simple heat exchanger geometries show the advantage of alloys over salts for fast storage.

27202 (CONF-801055—, pp 79-83) **Thermal energy storage for residential energy conservation.** Goldenberg, D. (TRW Inc., Oak Ridge, TN). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The potential for conservation of oil and gas was evaluated for thermal energy storage applications involving waste heat recovery and passive solar systems for houses that have gas- or oil-fired furnaces. A waste heat recovery device, using pebbles as the thermal energy storage medium, increases furnace seasonal efficiency to 95%. Passive solar system performance was estimated from work sponsored by the Department of Energy. Potential market sizes and penetrations were evaluated by region to determine national oil and gas savings. The total oil and gas savings, for the year 2000, were estimated to be 0.22 quads/year for the furnace waste heat recovery device and 0.10 quads/year for passive solar systems installed in houses heated by gas or oil furnaces.

27203 (CONF-801055—, pp 95-98) **Molten nitrate salt chemistry studies.** White, S.H.; Twardoch, U.M.; Bower, M.M. (EIC Labs., Inc., Newton, MA). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The contract is concerned with determining and quantifying the interaction of water and carbon dioxide in air with molten alkali nitrates in the temperature range 300 to 600°C. Electroanalytical methods involving voltammetry, chronopotentiometry and chronoamperometry at both rotating and stationary electrodes have been established to investigate this molten nitrate chemistry. The preliminary results show that water is reversibly removed from the melt up to 350°C. The activation energy associated with the water mass transfer coefficient is 4.4 kcal mol^{-1}. The reduction of water and the oxidation of carbonate and nitrite ions are complex electrochemical processes. In the case of the latter two reactions, because the products are gaseous, fast scan cyclic voltammetry and high current density chronopotentiometry will be necessary to avoid disturbances of the diffusion layer at high solute concentrations to enable the electroanalysis to be rigorous.

27204 (CONF-801055—, pp 104-108) **Status report of thermocline thermal energy storage studies at Sandia National Laboratories.** Gross, R.J.; Harrigan, R.W. (Sandia National Labs., Albuquerque, NM). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

Sandia National Laboratories is evaluating the thermocline thermal energy storage concept to fulfill the needs of solar thermal energy systems. The motivation for studying the thermocline concept is based not only on the first law of thermodynamics (efficiency), but also on the second law, which takes availability into account. A 1200 gallon engineering prototype tank has been constructed and is currently undergoing testing. Detailed small-scale laboratory experiments which focus on component development and computer code verification have been initiated. Complementary analytical modeling, both one- and two-dimensional, is also underway. The objective of this work is to determine whether thermocline storage is feasible and, if it is, to determine maximum expected performance, in both an engineering and economic sense.

27205 (CONF-801055—, pp 109-112) **Experimental and theoretical study of thermocline degradation.** Chaney, S.; Hayden, N.; Humphrey, J.A.C. (Univ. of California, Berkeley). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

A brief review is given of a research program investigating the basic fluid mechanics and heat transfer aspects of thermocline behavior in energy storage systems. The research consists of a three-pronged effort. Theoretical and numerical analyses are developed the results of which are to be compared with a laboratory-scale experiment. The experiment and theoretical approaches are described. The present status of the research program is outlined and anticipated accomplishments demarcated.

27206 (CONF-801055—, pp 133-136) **Collection and dissemination of thermal energy storage system information for the pulp and paper industry.** Edde, H. (Howard Edde, Inc., Bellevue, WA). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

A Department of Energy study presently underway is described which has as it purpose the collection and dissemination of TES system technology for the pulp and paper industry with the intent of reducing fossil fuel usage. The study plan is described and a description presented of example TES systems to be studied.

27207 (DOE/EA—0131) Environmental assessment. Aquifer thermal energy storage program. (USDOE Assistant Secretary for Conservation and Renewable Energy, Washington, DC). Jan 1981. 66p. NTIS, PC A04/MF A01. Order Number DE81027074.

The probable environmental consequences of developing and applying aquifer thermal energy storage are examined. In this technology, ground water is withdrawn from one well, heated (or chilled) in a heat exchanger, and then returned to the same aquifer through a second well. The thermal energy is stored in the aquifer until needed. At recovery, the second well is pumped, and the hot (or chilled) water circulated through the heat exchanger to recapture the stored energy, and the water is returned to the aquifer through the first well. Useable thermal energy to be used is derived from waste heat sources (e.g., power plant or industrial discharges), cogeneration, or from climate-derived sources (e.g., winter chill, melting snow, or solar energy). The thermal energy is stored during periods of low demand and retrieved for various uses such as space heating and cooling during periods of high demand. Initial demonstration projects under consideration are located in different regions of the United States, and will store thermal energy as hot water ($<165°C$) and chilled water ($>0°C$). Discussions of the proposed action, alternatives to the proposed action, the environment affected by the proposed action, and the potential environmental consequences of the proposed action are presented. References to literature, agencies, and persons consulted and a generic monitoring plan for consideration during the development of field facilities are included. (WHK)

27208 (DOE/NASA/3184—2) Heat storage in alloy transformations. Final report. Birchenall, C.E.; Gueceri, S.I.; Farkas, D.; Labdon, M.B.; Nagaswami, N.; Pregger, B. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center; Delaware Univ., Newark (USA). Dept. of Chemical Engineering). Mar 1981. Contract AI01-77ET26945. 166p. (NASA-CR—165355). NTIS, PC A08/MF A01. Order Number DE81026560.

A study conducted to determine the feasibility of using metal alloys as thermal energy storage media is described. The study had the following major elements: (1) the identification of congruently transforming alloys and thermochemical property measurements, (2) the development of a precise and convenient method for measuring volume change during phase transformation and thermal expansion coefficients, (3) the development of a numerical modeling routine for calculating heat flow in cylindrical heat exchangers containing phase-change materials, and (4) the identification of materials that could be used to contain the metal alloys. The elements selected as candidate media were limited to aluminum, copper, magnesium, silicon, zinc, calcium, and phosphorus on the basis of low cost and latent heat of transformation. Several new eutectic alloys and ternary intermetallic phases have been determined. A new method employing x-ray absorption techniques was developed to determine the coefficients of thermal expansion of both the solid and liquid phases and the volume change during phase transformation from data that are obtained during one continuous experimental test. The method and apparatus are discussed and the experimental results are presented. The development of the numerical modeling method is presented and results are discussed for both salt and metal alloy phase-change media. Candidate materials were evaluated to determine suitable materials for containment of the metal alloys. Graphite was used to contain the alloys during the volume change measurements. Silicon carbide has been identified as a promising containment material and surface-coated iron alloys were considered.

27209 Sulfuric acid and water chemical heat pump/chemical energy storage system. Clark, E.C. (Rocket Res Co, Redmond, Wash). pp 261-275 of Proceedings from the international seminar on thermochemical energy storage, 1980. Wettermark, G. (ed.). Stockholm, Sweden; Swedish Council for Building Research (1980).

From Workshop on thermochemical energy storage; Stockholm, Sweden (7 Jan 1980).

A chemical heat pump/chemical energy storage system (CHP/CES) has been designed, fabricated and successfully tested under the United States Department of Energy funding. This paper summarizes the operating characteristics of the sulfuric acid CHP/CES, recent test results, and discusses system economics and commercialization. 6 refs.

2508 Chemical

REFER ALSO TO CITATION(S) 27189, 27209

2509 Batteries

REFER ALSO TO CITATION(S) 27283

27210 (CONF-800806—47) Development of a tubular lithium-iron sulfide cell. Park, Y.W.; Shimotake, H. (Argonne National Lab., IL (USA); Korea Inst. of Science and Technology, Seoul (Republic of Korea)). 1980. Contract W-31-109-ENG-38. 14p. NTIS, PC A02/MF A01. Order Number DE81023126.

From 15. intersociety energy conversion engineering conference; Seattle, WA, USA (18 Aug 1980).

Lithium/iron sulfide cells have been investigated by several research laboratories in recent years, notably at Argonne National Laboratory (USA), for such applications as power sources for electric-vehicle propulsion and stationary energy storage for load leveling in electric utility networks. Performance requirements for these applications are high specific energy, high volumetric energy density, and high specific power. In addition, economic considerations must be given to minimize the fabrication cost without lowering performance or lifetime. Significant improvements have already been made in achieving high performance and long lifetime. However, the stringent cost requirements - $\sim$ \$50/kW-h for mobile applications and $\sim$ \$30/kW-h for stationary applications - have not been demonstrated yet. A tubular cell design in which a cylindrical electrode surrounded by an annular shaped electrode of the opposite polarity has been successfully adopted to produce low-cost cells such as LeClanche cells and Ni-Cd cells. This design may offer low-cost alternatives to the current prismatic and cylindrical cell designs being developed by other laboratories. The tubular Li/FeS cells currently being developed at the Korea Institute of Science and Technology are discussed. (WHK)

27211 (CONF-8007103—1) Advanced-battery technologies: where are they now. Yao, N.P. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 43p. NTIS, PC A03/MF A01. Order Number DE81023530.

From Industrial chemistry session-modern engineering and technology seminar; Taipei, Taiwan (7 Jul 1980).

Near-term and advanced secondary batteries that are under development in the USA for application to electric utility load-leveling, electric vehicles, and solar photovoltaic power systems are reviewed along with studies of their applications. Of the near-term batteries for utility application, the lead-acid battery is the only reliable and cost-effective candidate but, to be commercially viable for a broad spectrum of the utility market, its cycle life capability has to be significantly extended with little or no increase to the battery cost. Lead-acid, iron-nickel oxide, and zinc-nickel oxide systems are the potential near-term candidates for electric vehicle applications. However, these near-term battery technologies, particularly the life and the cost, will have to be improved to facilitate broader acceptance by users. In the near-term EV battery program, significant technological progress has been made over the last two years in the areas of specific energy, specific power, and manufacturing engineering. Present program emphasizes cycle life enhancement and reduction of battery cost. The near-term EV batteries are targeted

for initial commercialization in 1986. In parallel to the near-term battery program is the research and development of advanced batteries which have potentials of higher performance and lower cost. These advanced batteries include the ambient-temperature zinc-chlorine hydrate system, and the high-temperature lithium-iron sulfide and sodium-sulfur systems. (WHK)

27212 **(UTEC—81044) Electrolytic degradation of lithia-stabilized β''-alumina. Technical progress report, July 1, 1980-May 15, 1981.** Virkar, A.V. (Utah Univ., Salt Lake City (USA). Dept. of Materials Science and Engineering). Jun 1981. Contract AS02-77ER04451. 42p. NTIS, PC A02/MF A01. Order Number DE81025052.

Progress is described in the following areas; (1) effect of Se and Pb on the sodium/β''/ sodium cell studies; (2) transformation toughening of β''-alumina with small additions of unstabilized zirconia; (3) theoretical development of the model; (4) determination of current and potential distribution by the conformal transformation method; (5) determination of critical current density; and (6) fabrication of Ag-β''-alumina. Important findings include (1) additions of selenium to Na/β''alumina/Na cells drastically lowers the cell resistance and its temperature dependency is also altered; (2) β''-alumina can be significantly strengthened by the addition of ZrO_2; (3) experimentally determined i/sub Cr/ is in the range of 10 to 20 amps/cm^2; and (4) current concentration factor calculations have shown that the cracks in the center of a nonwetted area could be deleterious. Experimental evidence has been found. (WHK)

27213 **Use of multiple regression analysis to develop equations for predicting Li-Al/iron sulfide cell performance.** Gay, E.C.; Miller, W.E.; Martino, F.J. (Argonne Natonal Lab., IL). *Journal of Applied Electrochemistry ;* **11**: No. 4, 423-431(Jul 1981).

A multiple regression analysis was conducted to develop predictive equations for the specific energy and specific power of Li-Al/iron sulfide cells over a wide range of cell designs and operating variables. The intent was to make these equations as general as possible such that one set of equations would predict the performance of Li-Al/FeS or Li-Al/FeS_2 cells with bicell (one positive electrode and two facing negative electrodes) or multiplate cell configurations. Data from 33 cells were used in the analysis of specific energy, and 26 cells were used to develop the specific power equation. The calculated specific energy and specific power showed good agreement with the measured values for these cells. In general, the deviation between the calculated and measured values was within +- 10%. A check of the predictive capability of these equations also showed good agreement. The specific energy and specific power calculated for 14 cells not used in the regression analysis deviated by +- 10% from the measured values. These equations were used to identify the most likely cell designs to meet selected electric-vehicle battery performance goals. These designs were included in an experimental program for further performance evaluation. 12 figures.

27214 **Optimization of an electrochemical hydrogen-chlorine energy storage system.** Hsueh, K.L. (Clarkson College of Technology, Potsdam, NY); Chin, D.T.; McBreen, J.; Srinivasan, S. *Journal of Applied Electrochemistry ;* **11**: No. 4, 503-515(Jul 1981).

A mathematical model is presented for the optimization of the hydrogen-chlorine energy storage system. Numerical calculations have been made for a 20 MW plant being operated with a cycle of 10 h charge and 10 h discharge. Optimal operating parameters, such as electrolyte concentration, cell temperature and current densities, are determined to minimize the investment of capital equipment. 9 figures, 2 tables.

27215 **Effect of discharge current density on structure of the lead negative plate.** Wales, C.P.; Caulder, S.M.; Simon, A.C. (US Nav Res Lab, Washington, DC). *Journal of the Electrochemical Society ;* **128**: No. 2, 236-242(Feb 1981).

To help understand how the high current demands of an electric vehicle might affect the electrode microstructure and performance of lead-acid batteries, experiments were run wherein commercial negative plates were given 26 cycles of deep discharge at current densities of either 18, 125, 500, or 2000 A/m^2 The size of the $PbSO_4$ crystals in the discharged plates decreased roughly in correspondence to the decrease in plate capacity produced by the increasing current densities. This suggests passivation as the cause for loss of capacity, since passivation is accepted as becoming more critical as $PbSO_4$ crystal size decreases. The shapes of the electrode polarization curves indicate, however, that limited electrolyte diffusion rates and lessened contact of active material crystals, the result of the porosity that develops with cycling, may also be acting to reduce plate capacity. 15 refs.

29 ENERGY PLANNING AND POLICY

2901 Energy Analysis And Modeling

REFER ALSO TO CITATION(S) 27250, 27251, 27291, 27315

27216 **Statistical approach to model simplification and multiobjective analysis.** Kydes, A.S.; Draper, Y.; Finch, S.J. (Brookhaven National Lab., Upton, NY). *Energy (Oxford) ;* **6**: No. 2, 167-185(Feb 1981).

This paper describes a systematic statistical methodology for capturing, both visually and quantitatively, the trade-offs between competing quantifiable, differentiable objective functions in a model of the national energy system (Brookhaven Energy System Optimization Model). The aim is to provide decision makers with a more-easily understood tool and a more-easily defensible methodology on which trade-offs between certain sensitive and competing energy issues can be based. The methodology has the additional advantage of providing insights into the inherent structural relationships of the model (model simplification). 12 refs.

2902 Economics And Sociology

REFER ALSO TO CITATION(S) 26985, 27060, 27223, 27226, 27232, 27244, 27254, 27256, 27264, 27266, 27268, 27306, 27694, 27696

27217 **Land-ownership patterns and their impacts on Appalachian communities: a survey of 80 counties.** Washington, DC; Appalachian Regional Commission (1981). 840p. (NP—1903395).

This study was conducted by the Appalachian Land Ownership Task Force, an independent task force of citizens and scholars in the Appalachian Region. In 1979, this organization developed the concept of a comprehensive study of the ownership of land and resources in the Appalachian Region and of related impacts of ownership patterns on economic and community development issues, and received $130,000 from the Appalachian Regional Commission (ARC) for the 2-year study. The study covered 80 counties in Alabama, Kentucky, North Carolina, Tennessee, Virginia, and West Virginia. The study report documents ownership of land in rural Appalachia, covering such factors as the extent of corporate ownership, extent of absentee ownership, description of principal owners, rate of change in ownership, and land use. The report is divided into two parts: a regional overview and six addenda with statistical summaries for each state.

2903 Environment, Health, And Safety

REFER ALSO TO CITATION(S) 26799, 26801, 26977, 27310, 27319, 27633, 27680, 27692, 27695, 27697, 27698, 27762

27218 **Comparative risks from different energy systems: evolution of the methods of studies.** Hamilton, L.D. (US Brookhaven Natl Lab, NY). *International Atomic Energy Agency Bulletin ;* **22**: No. 5-6, 35-71(Oct 1980).

The difficulties in estimating health risks associated with different energy systems are discussed. There are five distinct stages in the development of methods to compare the health risks of different energy systems: comparing the health damages of electric power generation with other external risks/ standardizing this approach to a standard production rate, e.g., a 1000 Mwe power-plant year/ multiplying the 1000 Mwe power-plant year to calculate the risk to populations within 80 km of power plants/ determining the

health effects of renewable sources of energy/ and applying input-output analysis of health and environmental impacts to estimate actual health risks.

27219 **Environmental standards and energy policies.** Siddiqi, T.A.; Carpenter, R.A.; Hufschmidt, M. Honolulu, Hawaii; East-West Environment and Policy Institute (1981). 27p. (CONF-8003141—(Summ.)).

From Workshop on environmental standards and energy policies; Honolulu, HI, USA (9 Mar 1980).

This report reviews results from the Environment and Policy Institute (EAPI) of the East-West Center, established in October 1977 to conduct research and education programs through multinational collaboration on environmental aspects of policy and decision-making in the East-West Center region. The program of the Institute emphasizes (1) analysis of various policies (e.g., economic development, maritime jurisdiction) to illuminate their dependence and impacts on natural systems and thus on the objectives of the policies, and (2) assessment of scientific and technical information about natural systems for more coherent policy formulation and implementation through planning and management. This systematic approach avoids the polarization of environmental values versus sectoral goals.

2904 Natural Resources

REFER ALSO TO CITATION(S) 26891, 27217, 27238, 27693, 27695

27220 (SERI/CP—761-1077(Vol.2), pp 41-53) **Water resources of Saudi Arabia.** Al-Gwaiz, A.A. Mar 1981. NTIS, PC A07/MF A01.

From Solar desalination workshop; Denver, CO, USA (23 Mar 1981).

A summary is presented of existing ground water resources of Saudi Arabia, and of various proposals and plans to explore for new water resources, conserve exiting ones, and develop alternative sources. The committment of the government to provide by 1985 20 desalination plants scheduled to be operational along the Red Sea and Arabia Gulf coasts is discussed. Other projects briefly discussed include the treatment of recycling of sewage water and the desalination and reuse of agricultural drainage water. The need for the current water development plan for agricultural and industrial expansion of the country is pointed out.

27221 (SERI/CP—761-1077(Vol.2), pp 71-87) **Non-conventional system for water collection.** Sofrata, H. (Riyadh Univ., Saudi Arabia). Mar 1981. NTIS, PC A07/MF A01.

From Solar desalination workshop; Denver, CO, USA (23 Mar 1981).

Current technology for water desalination is reviewed briefly with particular emphasis on the Mitsubishi adsorption-desorption process. A description is given of a system for water collection by condensation of humidity in the air. The method is particularly appropriate for the humid environment typical to the Gulf area of Saudi Arabia and is based on condensation of water vapor on the cooling coils of a central air-conditioner. The process is also capable of providing humidity control. (MJJ)

2905 Research, Development, Demonstration, And Commercialization

REFER ALSO TO CITATION(S) 27190, 27191, 27237, 27253, 27263, 27296, 27321

27222 **(DOE/MA—0012) Guide to preparation of Department of Energy procurement and financial assistance planning forms.** (USDOE Assistant Secretary for Management and Administration, Washington, DC). Jul 1981. 35p. NTIS, PC A03/MF A01. Order Number DE81025519.

A procurement and federal assistance planning system is vital to effective and efficient management of the Department of Energy's mission. The planning system is essential to the procurement and Federal assistance process. It gives Departmental managers and the procurement community information on how DOE plans to do business in the next fiscal year as well as the extent of competition in the Departmental procurement process. Planning information is used to forecast procurement workload and plans for increased competition. Good planning can be a tool to efficiently manage resources in order to expedite the timely acquisition of equipment and contractual services and continue the Department's mission. Planning is the first step in the procurement and financial assistance process and the Integrated Procurement Management Information System (IPMIS). Therefore, it is essential that planning forms are accurately completed and updated to provide the initial source data for planned procurement and assistance transactions. The complete Guide to Preparation of Department of Energy Procurement and Financial Assistance Planning Forms was revised to incorporate the latest changes in IPMIS. This Guide and a memorandum which officially requests DOE offices to submit planning forms for all planned procurement and assistance transactions provide instructions for completing the forms and other information relative to fulfilling this requirement. The planning forms are DOE F-4200.6, DOE-F-4200.7 and DOE-F-4200.8. These forms and this Guide can be obtained from any Headquarters supply store, regional offices, operations offices, energy research centers, project offices and power administrations.

27223 **(ORNL/Sub—80/45734/1) Consumer choice and market penetration of new technologies: application of a discrete-choice model. Final report. CRA report No. 423.** (Oak Ridge National Lab., TN (USA); Charles River Associates, Inc., Boston, MA (USA)). Jun 1980. Contract W-7405-ENG-26. 76p. NTIS, PC A05/MF A01. Order Number DE81027082.

The purpose of this report is to demonstrate the feasibility of developing a full-scale disaggregate structural model of market penetration. An equipment choice model, which represents the most crucial and one of the most intractable components of the disaggregate model, is developed and estimated using data on residential space heating equipment. This econometric model is incorporated, along with empirical representations of equipment replacement, depreciation, and capital stock growth, in a simulation model to represent a limited version of a disaggregate structural model of market penetration. The penetration of an example new technology is then evaluated to demonstrate the advantages achieved by pursuing a disaggregate structural approach to modeling market penetration. Discrete choice modeling literature is briefly surveyed in the second chapter. Chapter 3 describes the data base used to estimate the model and Chapter 4 presents the estimation results. In Chapter 5 the empirical discrete choice model is combined with the optimal replacement relationships, a simple representation of the characteristics of the existing space heating equipment stock, and assumptions concerning future stock growth to develop a limited version of the disaggregate structural model. The final chapter concludes with a short discussion of future research required to extend the components of the limited model version to yield a detailed policy-oriented model of market penetration.

2906 Nuclear Energy

REFER ALSO TO CITATION(S) 27153, 27157, 27183, 28006, 28027

2907 Transport And Storage

REFER ALSO TO CITATION(S) 27189

2908 Waste Heat Utilization

REFER ALSO TO CITATION(S) 27106, 27190, 27191

2910 Conservation

REFER ALSO TO CITATION(S) 27250, 27291, 27305, 27307, 27308, 27313, 27330, 27337, 27340

27224 (CONF-8010146—, pp 31-37) **Utilities and energy efficiency.** Hallman, R.M. (Dept. of Energy, Washington, DC). Jan 1981. NTIS, PC A08/MF A01.

From Utilities and energy efficiency: new opportunities and risk; Port Chester, NY, USA (23 Oct 1980).

The national energy situation is briefly examined. How best to effectively top our conservation and renewable resources is addressed. Utilities, one of several possible institutions that can improve energy efficiency and productivity, are discussed. Some utilities have instituted programs formulating general energy plans that emphasize resources and conservation. DOE is encouraging utilities, as they plan ways to meet future energy demand and use of their financial resources, to review all investment alternatives, including investments in end-use energy efficiency, cogeneration, load management, renewable resource technology, and decentralized generation - with the overall objective of determining the most effective, economical combination of investments to serve customer needs. This is directly related to the national aim of reducing the use of oil and gas in the utility sector. It is agreed that conservation and renewable resource activities on the part of utilities are not only legitimate but are essential to this nation's energy-efficient future.

27225 (CONF-8010146—, pp 39-62) **Least-cost energy strategies.** Sant, R.W. (Mellon Inst., Pittsburgh, PA); Graff, T.J.; Hauspurg, A.; Koger, R.K. Jan 1981. NTIS, PC A08/MF A01.

From Utilities and energy efficiency: new opportunities and risk; Port Chester, NY, USA (23 Oct 1980).

The discussion focuses on identifying and analyzing the potentially cost-effective technologies both on the supply and the demand side. The discussion also identifies the analyses and criteria required to make appropriate policy choices. The different circumstances facing the utilities throughout the country are described and differences in policy options are examined.

27226 (CONF-8010146—, pp 63-85) **Equity implications of least-cost strategies.** Shanaman, S.M.; Mertz, R.M.; Shaine, W.L.; Wishart, R.S. Jan 1981. NTIS, PC A08/MF A01.

From Utilities and energy efficiency: new opportunities and risk; Port Chester, NY, USA (23 Oct 1980).

The discussion emphasizes the distributional effects of alternative least-cost energy strategies. Will, for example, the optimal strategy offer a distribution of benefits that has an undesirable effect on small users or the poor. The discussion also focuses on how the benefits are distributed over time. For example, will certain types of users be precluded from gaining benefits from a program during its early stages.

27227 **(LA-UR—81-1202) Financing options for a local conservation and solar retrofit program.** Mathews, R. (Los Alamos National Lab., NM (USA); California Univ., Los Angeles (USA)). 1981. Contract W-7405-ENG-36. 6p. (CONF-810509—31). NTIS, PC A02/MF A01.

From Annual conference of the International Solar Energy Society; Philadelphia, PA, USA (26 May 1981).

Several public financing approaches are evaluated and a brief assessment of their attractiveness is made on the basis of costs/benefits, political acceptability, and administrative efficiency. The financing approaches considered have particular relevance to 1 to 4 unit owner occupied dwellings but may potentially be used for other sectors as well. An effective program will attempt to involve private entities, so as to leverage scarce resources and to promote broader community support. The roles of banks and Savings and Loans Associations, consumer cooperations and utilities are considered as a means of expanding the scope of a local financing program for energy efficient technologies.

2920 Supply, Demand, And Forecasting

REFER ALSO TO CITATION(S) 26993, 27251, 27290, 27340

27228 **Future supply of gas.** Prior, M.J.; Teper, M. (IEA Coal Research London, Engl). *Energy Policy ;* **8**: No. 4, 308-317(Dec 1980).

The authors consider the future supply of gas deriving from conventional natural gas, 'exotic' natural gas, and coal gasification. Cost estimates for these are examined, and some forecasts made of supply/demand balances to the year 2000.

2930 Policy, Legislation, And Regulation

REFER ALSO TO CITATION(S) 26813, 26844, 26845, 26858, 26859, 27219, 27235, 27307, 28027

27229 **(CONF-8010146—) Utilities and energy efficiency: new opportunities and risks. Conference proceedings.** (ICF, Inc., Washington, DC (USA)). Jan 1981. Contract AM01-78RG03370. 154p. NTIS, PC A08/MF A01.

From Utilities and energy efficiency: new opportunities and risk; Port Chester, NY, USA (23 Oct 1980).

A separate abstract was prepared for each of the eight papers (with discussions) presented at the conference. All abstracts will appear in Energy Research Abstracts (ERA and Energy Abstracts for Policy Analysis (EAPA). (MCW)

27230 (CONF-8010146—, pp 89-96) **Alternatives to traditional regulation.** Bower, R.S. (New York State Public Service Commission, Albany). Jan 1981. NTIS, PC A08/MF A01.

From Utilities and energy efficiency: new opportunities and risk; Port Chester, NY, USA (23 Oct 1980).

Why alternatives to traditional regulation for utilities should be considered at this time and the aims that regulation and alternatives are designed to accomplish are discussed. Criteria that should be applied in deciding whether to try alternatives and which ones to try are described. Possible alternatives and what will actually determine which alternatives will be tried and which will succeed are discussed at length.

27231 (CONF-8010146—, pp 97-112) **Limiting the scope of regulation.** Graham, W.E. Jr.; Freeman, R.M.; Kadane, D.K.; Walker, R. Jan 1981. NTIS, PC A08/MF A01.

From Utilities and energy efficiency: new opportunities and risk; Port Chester, NY, USA (23 Oct 1980).

Four panelists explored some alternative ways in which regulation can be reduced. These included: below-the-line treatment of certain activities within a utility company; establishment of a subsidiary company to handle certain nonmonopoly functions such as home energy audits; and establishment of a separate unregulated company that has no financial ties to the utility. From their respective disciplines, the panelists addressed the issues involved in how to spin off the assets of the regulated monopoly to a less-regulated subsidiary or separate company; how to price the products and services of the less-regulated entity; how to guard against other regulators confiscating the higher profits that may be earned by the new entity through greater risk-taking; and how to decouple the financial ties between the parent utility and the subsidiary or new entity.

27232 (CONF-8010146—, pp 113-132) **Regulatory preapproval of utility investment.** Jones, D.N.; O'Leary, J.F.; Jadrosich, P.J.; Gelder, R.H. Jan 1981. NTIS, PC A08/MF A01.

From Utilities and energy efficiency: new opportunities and risk; Port Chester, NY, USA (23 Oct 1980).

The possibility of reducing risks to investors by sharing responsibility for investment decisions between the regulator and the company is explored. An example of this would be the preapproval of all major generating-and-transmission plant investments before such investments are made. Another example might be a utility's request for commission approval of investments in coal-conversion equipment before the necessary EPA permits are issued. This presentation explores the problems of having the regulator make decisions in parallel with the utility manager.

27233 **(DOE/MA—0014) Department of Energy contracting officers regulation: cross reference guide.** Cavanagh, J.; Arbanas, C.; Benson, R.; Lovett, E.; Sandberg, N. (USDOE Assistant Secretary for Management and Administration, Washington, DC. Directorate of Procurement and Assistance Management). Jul 1981. 13p. NTIS, PC A02/MF A01. Order Number DE81026677.

This cross reference guide has been prepared as an unofficial listing of regulations and other directive type publications related to current high interest subjects. The purpose is to help assure that all

pertinent policies on the subject are known to Contracting Officers and others involved in the day-to-day contracting process. It is hoped this will reduce the time spent in researching information relative to the subjects. The approach adopted is to present a brief discussion of the background or purpose, followed by the identification of all known directives on the subject and the key aspects of each of the directives. It is planned that the guide will be a growing document with additional subjects incorporated periodically.

27234 **(EMD—81-12) Unauthorized commitments: an abuse of contracting authority in the Department of Energy.** Staats, E.B. (General Accounting Office, Washington, DC (USA)). 4 Dec 1980. 39p. General Accounting Office, Gaithersburg, MD. Order Number DE81903689.

The Department of Energy relies heavily on contractors to help carry out its missions, reporting expenditures for contracted goods and services during fiscal year 1979 of about $9.2 billion. GAO's review disclosed that contractors perform work for DOE without a contract. This occurs because agency personnel, who do not have the authority to bind the Government to a contract, make unauthorized commitments to contractors. These commitments avoid competition and circumvent procurement regulations. Although GAO identified several reasons why unauthorized commitments occur, such commitments are never an appropriate method of obtaining goods or services. DOE's use of unauthorized commitments has violated Federal law and regulations. GAO recommends actions to help eliminate the use of unauthorized commitments in DOE.

2940 Fossil Fuels

REFER ALSO TO CITATION(S) 26799, 26801, 26807, 26813, 26834, 26844, 26844, 26845, 26845, 26848, 26850, 26851, 26858, 26859, 27228, 27244, 27696

27235 **(CONF-810658—1) Coal: the refocused federal program.** Legassie, R.W.A. (USDOE Assistant Secretary for Fossil Energy, Washington, DC). Jun 1981. 12p. NTIS, PC A02/MF A01. Order Number DE81025685.

From 11. biennial lignite symposium; San Antonio, TX, USA (15 Jun 1981).

The main theme of this address is how the importance placed on coal is being translated into energy policy and specifically the role the administration sees low-rank coal playing in carrying out this policy. In spite of severe budget cuts in the fossil-energy field, the administration is committed to fossil energy development. The respective roles of government and industry are defined. The administration is currently reviewing the Clean Air Act and Surface Mining Control and Reclamation Act with the intention of modifying some provisions. Resource development on federal lands is also discussed. The administration backs the Great Plains Gasification Project which is privately sponsored with federal loan guarantees. R and D efforts in the liquefaction, combustion, and slurry transport of lignite are described. International cooperation and information exchange in low-rank coal research is being encouraged. (DMC)

27236 (EPRI-WS—79-238(Vol.1), pp Section 3, 3.1-3.10) **Program on new coal conversion technologies of the Federal Republic of Germany.** Diehl, H.; Holighaus, R. (Kernforschungsanlage Juelich GmbH, Germany). May 1981. NTIS, PC A18/MF A01.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

Today's energy research will shape the power supply pattern we shall have in 20 or 30 year's time. Coal will gain in importance worldwide simply because there are large coal reserves. That is especially true for Germany. As its role becomes more significant, the demand for advanced technologies of coal utilization will grow. An increased use of coal involves environmental hazards, particularly in industrial conurbations. Coal must replace mineral oil and natural gas, but its adverse environmental effects must be minimized. The relevant technologies are available. During the next few years, it will be necessary to find the appropriate ways and means of achieving their commercialization. One feature of advanced systems for the power generation from coal is the removal of sulfur during the power generation process itself. This means that the costly and technically complicated flue gas desulfurization is no longer necessary. In addition, the advantages of the gas turbine can for the first time be exploited for coal-fired power stations. The efficiency achieved by the combined gas/steam turbine cycle exceeds 40%. The development lines pursued in the Federal Republic are power stations using: fluidized-bed firing under pressure, pressurized coal gasification, and the VEW coal conversion process. The Federal Republic also cooperates in a project carried out under the auspices of the International Energy Agency. The development of a power station combined with a pressurized coal gasification plant is of considerable importance. Some of the new coal gasification techniques which are at present being tested on pilot plants are well suited to be combined with a power station. The VEW coal conversion process is designed first and foremost for a power station. Here the coal is degassed and partially gasified. The residual coke, which has a low sulfur content, is fired in the power plant.

27237 (EPRI-WS—79-238(Vol.1), pp Section 4, 4.1-4.12) **Department of Energy synthetic fuels program: a 1980 perspective.** Fumich, G. Jr. May 1981. NTIS, PC A18/MF A01.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

The objectives of the US Department of Energy synthetic fuels program are straightforward: first and foremost, we must reduce our dependence on oil imports - more rapidly than would be possible by traditional private industry actions alone. Second, we have established a series of environmental objectives. Although we may differ on particular regulations or laws, we all share a concern for a clean, healthful environment. Our efforts must not be directed at diluting environmental standards, but working to develop technology that will enable us to produce energy both in compliance with existing laws and in the future, in compliance with even stricter environmental requirements. Maintaining acceptable energy prices and minimizing societal disruptions are also important objectives. We must give high priority to reducing the social and economic costs of our energy program to the consumer. In summary, the national synthetic fuels program today has a strong emphasis on replacing foreign oil with clean, economic substitutes, with technology being supported to derive substitute fuels from coal, oil shale, and tar sands. Our nation's imbalance between demand and supply has been a long time coming and it will be a long time before we bring it back into order. There is no quick fix, no technological breakthrough in sight. And it is important that the momentum continues: at present inflation rates, the $2 billion cost of a synfuels plant increases almost $30,000 an hour. But by beginning as we have, we are moving closer each day to the time when synthetic fuels will compete in the marketplace with conventional hydrocarbons. Moreover, we are closer to the day when we can place a cap on the price of world oil. That alone would make the synthetic fuels effort well worth the cost.

27238 **(ID—81-07) Potential for diversifying oil imports by accelerating worldwide oil exploration and production.** Staats, E.B. (General Accounting Office, Washington, DC (USA)). 25 Nov 1980. 93p. GPO. Order Number DE81903696.

Diversifying US imported oil sources to reduce US dependency on unstable countries in the Middle East and North Africa is not a viable short-range solution due to the lack of alternative suppliers with sufficient excess production capacity in the world. Mid- to long-range potential (5 to 15 years from now) is uncertain but more promising, partly because of increasing production from Mexico and partly because of the concentration of current oil company exploration efforts outside the Middle East and North Africa. There is still considerable petroleum potential throughout the world, but realization of this potential depends upon accelerated exploration, especially in less developed countries. Governments' actions, such as expropriation and high rates of taxation, have discouraged private investment in oil exploration in many of the more promising areas.

27239 **(P—300-80-031) Annual energy production and consumption, 1979.** Rodman, E.D. (California Energy Resources Conservation and Development Commission, Sacramento (USA). Assessment Div.). Oct 1980. 65p. California Energy Commission, Sacramento. Order Number DE81903660.

Major California oil and gas producers, major California oil and gas marketers, and all California oil refiners and electric and gas utilities must report fuel and energy data to the California Energy Commission. This report summarizes actual data for the months January 1976 through December 1979.

27240 **Legal obstacles to decentralized solar energy technologies.** Miller, A.S. (Natural Resources Defense Council, Washington, DC). pp 148-195 of Non-technical obstacles to the use of solar energy. Strub, A.; Steemers, T.C. (eds.). New York, NY; Harwood Academic Publishers (1980).

From Symposium on non-technical obstacles to the use of solar energy; Brussels, Belgium (20 May 1980).

A survey of current issues in solar law is presented in 2 parts. The first part focuses on the problem of ensuring solar access for decentralized applications. Providing for solar access is a complex problem, since solar access must be balanced against other desirable social goals. Existing law does not provide solar users with a right to sunlight, except in a few jurisdictions which have adopted one or another legislative scheme for protection of solar users. Public authorities may act to provide solar access protection, which will have the desirable effect of removing one uncertainty which may be a deterrent to potential purchasers of solar equipment. Such protection may be achieved on an areawide basis through zoning provisions, through requirements that the development process include consideration of the issue, or by other means. A number of jurisdictions have acted to provide a legal framework in which individuals may achieve protection of their access to sunlight on a lot-by-lot basis. Balancing the need of solar users for access to sunlight with the rights of adjacent property owners can be a complex task; the concept of transferable development rights offers at least one possible solution, although of limited application. In the second part, the discussion focuses on potential obstacles to solar energy use posed by public and private aesthetic restrictions on land use; on problems relating to building codes, warranties, and product standards; on financial issues; and on the effects on solar development of utility rate regulations.

2950 Hydrogen And Synthetic Fuels

REFER ALSO TO CITATION(S) 26943, 27108, 27228, 27237, 27694

27241 **(EPRI-WS—79-238(Vol.1)) Synthetic fuels: status and directions. Volume 1. Sections 1-17. Conference proceedings.** (Electric Power Research Inst., Palo Alto, CA (USA); Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.)). May 1981. 406p. (CONF-8010150—(Vol.1)). NTIS, PC A18/MF A01. Order Number DE81903476.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

This report contains the Proceedings of the Conference on Synthetic Fuels: Status and Directions. The Conference was cosponsored by the Electric Power Research Institute and the Juelich Nuclear Research Center (KFA) acting on behalf of the German Federal Ministry for Research and Technology (BMFT). The papers represent the work of organizations in the United States, the Federal Republic of Germany, and Great Britain. Perspectives on synthetic fuels by utility industry representatives and administrators of energy programs are also included. The conference was held in San Francisco, CA, October 13 to 16, 1980. Eighteen papers from Volume 1 have been entered individually into EDB and ERA, and three also into EAPA. (LTN)

27242 (EPRI-WS—79-238(Vol.1), pp I.1-I.9) **Background of the United States Synthetic Fuels Corporation.** McClure, J.A. May 1981. NTIS, PC A18/MF A01.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

There are inherent problems in the Synthetic Fuels Corporation concept, as enacted. The first and perhaps the most obvious of these problems lies in the production goal targeted by the legislation. According to an EPRI study, to meet this goal, considerable financial incentives beyond those provided by the US Synthetic Fuels Corporation will be required. A second problem is the multiple and rather distinct responsibilities that the Chairman and his limited staff of 300 are charged with performing. They are responsible for analyzing the merits of different technological proposals, determining the most suitable investment strategy for the corporation, and preparing the justification for the comprehensive production strategy. The Congress wanted the Synthetic Fuels Corporation to be primarily a banking organization, not staffed with bureaucrats but with hard-nosed businessmen trained in high finance and possessed with the expertise to make the synthetic fuels program a reality. We wanted the SFC to be an entity that would instill confidence in the private sector as to its continuity of purpose and its ability to deliver on what it contracted to do. A third issue which the Corporation is going to have to deal with involves the proprietary nature of many of the most promising candidates for demonstration and initial commercialization. The promoters of these technologies have significant proprietary positions and these companies will not seek SFC funds because of the disclosure and reporting requirements placed upon them by the Corporation. The effect of this may be that the government will fund some of the least attractive processes, both technically and economically, thus retarding commercialization. Finally, the last major problem is the lack of power that it has with respect to the expediting, licensing, and permitting of synthetic fuel plants.

27243 (EPRI-WS—79-238(Vol.1), pp Section 2, 2.1-2.6) **Synthetic fuels in California.** Papay, L.T. May 1981. NTIS, PC A18/MF A01.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

Southern California Edison believes that synthetic fuels can play an important role in developing our independence from foreign oil. With appropriate and timely regulatory and permitting treatment, synthetic fuels can make this contribution by 1990. The need for now is to take the steps necessary to aggressively pursue the most favorable projects through the study phase and definitive engineering, construction, and operation. The problems leading to these conclusions are discussed in some detail: air pollution control regulations (Rule 62, 1958 and 1968 modifications), availability of low sulfur oil and natural gas along with price increases in 1973 and 1979, problems with nuclear and coal plants (e.g., cancellation of Kaiparowitz project after various environmental lawsuits and inflation of cost), need for very clean synthetic fuels (i.e., limited sulfur and nitrogen compounds), and feasibility tests (including combustion in some cases) of gasified coal by the Texaco process, shale oil, methanol, etc. (LTN)

27244 (EPRI-WS—79-238(Vol.1), pp Section 5, 5.1-5.15) **Dynamics of interdependence: synfuels versus Middle Eastern oil.** Stauffer, T.R. May 1981. NTIS, PC A18/MF A01.

From Conference on synthetic fuels: status and directions; San Francisco, CA, USA (13 Oct 1980).

The economic and political viability of synfuel programs hinges more upon developments in the Middle East than upon developments in laboratories. The price of Middle East oil sets the level of needed subsidies, while the spectre of cutoffs adds urgency to all alternatives, including synfuels. The relationship is reversible: high-profile, high-cost demonstration synfuel projects could provide incentive targets to OPEC for further price increases. The overhang of possible increasing production in the Middle East remains a long-term threat to high-cost alternatives. The areas' oil and gas resources are notably understated, primarily because little or no exploration has occurred in major prospecting areas after the early 1960's and because no economic outlet whatsoever existed for natural gas until the last few years. The Middle East oil price is a completely politicized parameter, and prospects for price moderation are inextricably linked to a peaceful resolution of the Arab-Israeli conflict. Volumes of potential Middle East oil are larger than usually forecast, and its price is discretionary. Closing synfuels feasibility gap thus hinges upon Middle East politics. Economics has been all but completely subverted in the pricing and supply of Middle East oil as access to Middle East oil even absent warfare or an embargo, is increasingly restricted within the compass of bilateral arrange-

ments between producers and consumers. These have proliferated, now involve most important oil-importers, and cover possibly one-half of total Middle Eastern supply. The United States is conspicuously not included, reflecting its political isolation in the Arab world, the European-Japanese-OAPEC initiatives, and, secondarily, new US tax laws which discourage US firms from exploring abroad.

27245 **Utilization of biomass in the US for the production of ethanol fuel as a gasoline replacement. 1. Terrestrial-resource potential.** Ferchak, J.D.; Pye, E.K. (Univ. of Pennsylvania, Philadelphia). *Solar Energy ;* **26**: No. 1, 9-16(1981).

The paper presents a review of the literature that deals with the analysis of the potential of ethanol fuel for use in "gasohol," a blend of 10% ethanol with gasoline. The size of the biomass-resource base and, therefore, its potential contribution to liquid fuel is discussed. 44 refs.

27246 **Utilization of biomass in the US for the production of ethanol fuel as a gasoline replacement. 2. Energy requirements, with emphasis on lignocellulosic conversion.** Ferchak, J.D.; Pye, E.K. (Univ. of Pennsylvania, Philadelphia). *Solar Energy ;* **26**: No. 1, 17-25(1981).

The paper presents an estimate based on published reports of the relative motor-fuel value of ethanol as compared to gasoline and diesel. 47 refs.

2960 Electric Power

REFER ALSO TO CITATION(S) 26977, 27016, 27106, 27107, 27229, 27232, 27264, 27265, 27267

27247 (CONF-8010146—, pp 13-20) **State regulation and energy efficiency.** Zielinski, C.A. (New York State Public Service Commission, Albany). Jan 1981. NTIS, PC A08/MF A01.

From Utilities and energy efficiency: new opportunities and risk; Port Chester, NY, USA (23 Oct 1980).

The relationship between state regulation of the electric utility industry and energy efficiency is discussed. Goals of regulation are discussed. An analysis is presented on how regulation, in its pursuit of the various goals, affects energy efficiency of utility customers and the regulated utility companies. Examples are given. Investment risks for the utility industry and solutions are briefly discussed. A major solution involves allocating the risk between consumers and investors.

27248 **(DOE/EP—0017) Electric-utility-system-operator selection and training.** (USDOE Assistant Secretary for Environmental Protection, Safety and Emergency Preparedness, Washington, DC. Office of Emergency Operations). Jun 1981. 45p. NTIS, PC A03/MF A01. Order Number DE81024489.

The July 1977 power blackout in New York vividly illustrated that the overall control of the bulk electric power supply system ultimately rests with the several human beings occupying power system operator positions. Following that blackout, an investigation was initiated to obtain information on the selection, training and licensing of power system operators. Using that information, this report was prepared as a basic document on electric utility system operator selection and training and describes a system operator's tasks, the many training and development programs being used and the prospective needs for the qualification and requalification of electric utility system operators. Specific recommendations are made on the responsibilities of utility system managers relative to overseeing operator performance and on the selection, training and evaluation of power system operators. (LCL)

27249 **(DOE/ET/30351—T2) Assessments and requirements for the integration of new technologies into electric utility systems. Summary of the Aerospace Corporation activities, January-November 1980.** Cretcher, C.K.; Davey, T.H. (Aerospace Corp., Los Angeles, CA (USA). Energy and Resources Div.; Aerospace Corp., El Segundo, CA (USA). Energy and Resources Div.). 1980. Contract AT03-76ET30351. 51p. NTIS, PC A04/MF A01.

The activities of the energy and Resources Division of The Aerospace Corporation during the period 1 January to 15 November 1980 in support of the DOE Office of Electric Energy Systems (EES) are summarized. The overall objectives of the support services efforts provided to EES in the Integration of New Source Technologies and System Control and Development Programs were to: (1) assist in the planning and definition of EES programs; (2) provide technical assistance to EES management of industrial/university contracts; (3) support the coordination of the EES Program with other related ongoing activities; and (4) enhance the flow of information between EES and the electrical utilities. (WHK)

27250 **Linear-programming model for minimizing US oil consumption.** Masud, E. (US DOE, Washington, DC). *Electric Power Systems Research ;* **4**: No. 1, 5-12(Jan 1981).

The model can be employed to determine the theoretical upper bound on oil savings against which performance can be measured. It can also be used to identify oil-conservation options on an hourly basis. In conjunction with other models it can be used to determine system additions and contractual changes necessary for exercising these options. Further, the results can be verified by inspection. Test results using actual hourly data for the Eastern Interconnected System indicate that significant oil savings, over and above those already achieved by electricity transfers, may be realizable. 5 refs.

27251 **Specification, estimation, and forecasts of industrial demand and price of electricity.** Chang, H.S. (Univ. of Tennessee, Knoxville); Chern, W.S. Contract W-7405-ENG-26. *Energy Systems and Policy ;* **5**: No. 3, 219-242(1981).

This paper discusses the specification of electricity-demand and price equations for manufacturing industries and presents empirical results based on the data for 16 Standard Industrial Classification (SIC) three-digit industries from 1959 to 1976. Performances of estimated equations are evaluated by sample-period simulation tests. The estimated coefficients are then used to forecast electricity demand by industry. Results show that most of the estimated coefficients have expected signs and are statistically significant. The estimated equations perform well in terms of sample-period simulation tests, registering small mean absolute percentage errors and mean square percentage errors for most of the industries studied. Forecasted results indicate that total electricity demand by manufacturing industries would grow at an average annual rate of 3.53% according to the baseline forecast, 2.39% in the high-price scenario, and 4.76% in the low-price scenario. The forecasted growth rates vary substantially among industries. The results also indicate that the price of electricity would continue to grow at a faster rate than the general price level in the forecasted period 1977 to 1990. 19 references, 6 tables.

2980 Consumption And Utilization

REFER ALSO TO CITATION(S) 27306

2990 Unconventional Sources And Power Generation

REFER ALSO TO CITATION(S) 26801, 26978, 26985, 27007, 27013, 27029, 27090, 27106, 27227, 27245, 27246

27252 **(DOE/BP—38) Proceedings: second annual Pacific Northwest alternative and renewable energy resources conference.** (Bonneville Power Administration, Portland, OR (USA)). 1980. 127p. (CONF-8010172—). NTIS, PC A07/MF A01.

From 2. annual Pacific Northwest alternative and renewable energy resources conference; Portland, OR, USA (27 Oct 1980).

Papers presented at the conference are published in this volume. The purpose of the conference was to solicit regional cooperation in the promoting of near-term development of such alternative and renewable energy resources in the Pacific Northwest as: cogeneration; biomass; wind; small hydro; solar end-use applications; and geothermal direct heat utilization. Separate abstracts of selected papers were prepared for inclusion in the Energy Data Base.

27253 **(SERI/TR—625-1170) Alcohol fuel activities at the Solar Energy Research Institute, 1981.** Morriss, V. (Solar Energy Research Inst., Golden, CO (USA)). May 1981. Contract AC02-77CH00178. 60p. NTIS, PC A04/MF A01. Order Number DE81025916.

The purpose of this report is to present and describe the SERI R and D activities in alcohol fuels during FY 1981. The report summarizes both in-house and subcontracted research tasks. Individual task summary sheets report budget allocations, the objectives, and the technical approach. The major emphasis of the program is on cellulose-to-ethanol process development, with a smaller emphasis on methanol synthesis through gasification. To improve biological processing of biomass, the program also continues many of the long-lead-time, basic research tasks in such areas as recombinant DNA, genetics, and mutant strain selection.

27254 **Non-technical obstacles to the use of solar energy.** Strub, A.; Steemers, T.C. (eds.). New York, NY; Harwood Academic Publishers (1980). 465p. (In English and French). (EUR—7003; CONF-8005165—).

From Symposium on non-technical obstacles to the use of solar energy; Brussels, Belgium (20 May 1980).

The International Symposium on Non-Technical Obstacles to the Use of Solar Energy addressed itself to this topic by pursuing the following aims: to identify those non-technical obstacles which can impede the wider use and exploitation of solar energy in industrialized countries; to identify and evaluate measures which are being or could be used to minimize or overcome the impacts of the identified obstacles; and to make recommendations. Separate abstracts for individual papers have been prepared for inclusion in the Energy Data Base.

27255 **Overcoming solar barriers: progress in the United States.** Hayes, D. (Solar Energy Research Inst., Golden, CO). pp 2-12 of Non-technical obstacles to the use of solar energy. Strub, A.; Steemers, T.C. (eds.). New York, NY; Harwood Academic Publishers (1980).

From Symposium on non-technical obstacles to the use of solar energy; Brussels, Belgium (20 May 1980).

27256 **Obstacles in an European country: the case of France.** Durand, H. (Commissariat a l'Energie Solaire, Paris, France). pp 13-22 of Non-technical obstacles to the use of solar energy. Strub, A.; Steemers, T.C. (eds.). New York, NY; Harwood Academic Publishers (1980).

From Symposium on non-technical obstacles to the use of solar energy; Brussels, Belgium (20 May 1980).

The lack of natural energy resources has led France to adopt a voluntary renewable energy program, with ear-marked priorities for solar heating (space and sanitary water) and biomass. Some non-technical obstacles have been identified within the solar heating program: they cover institutional, economical, and psychological difficulties. The major cause of these obstacles lies in the general ignorance of the public, and to a lesser extent of professionals, about solar energy in general and applications in particular. Yet, the very large (50 millions US dollars/year) of incentive fundings devoted now in France for solar heating may rapidly overcome some, if not all, of these problems.

27257 **Non-technical obstacles to the use of solar energy.** Wells, A.B. (Institute of Man and Resources, Charlottetown, Prince Edward Island). pp 23-36 of Non-technical obstacles to the use of solar energy. Strub, A.; Steemers, T.C. (eds.). New York, NY; Harwood Academic Publishers (1980).

From Symposium on non-technical obstacles to the use of solar energy; Brussels, Belgium (20 May 1980).

The principal obstacles impeding widespread use of renewable energy are our perceptions of society and our place in that society. These perceptions, and the way in which they are formed, will be either an obstacle or a facilitator to the use of solar energy. The author describes seven key factors which influence our perceptions: ignorance, indifference, fear, finance, profit, influence, and organization.

27258 **Non-technical obstacles to the use of solar energy.** Wallner, I. (German Solar Energy Industries Association, Essen, Germany). pp 38-46 of Non-technical obstacles to the use of solar energy. Strub, A.; Steemers, T.C. (eds.). New York, NY; Harwood Academic Publishers (1980).

From Symposium on non-technical obstacles to the use of solar energy; Brussels, Belgium (20 May 1980).

27259 **Early market experience of solar energy in the United States.** Hirshberg, A.S. (Booz, Allen and Hamilton, Bethesda, MD). pp 47-62 of Non-technical obstacles to the use of solar energy. Strub, A.; Steemers, T.C. (eds.). New York, NY; Harwood Academic Publishers (1980).

From Symposium on non-technical obstacles to the use of solar energy; Brussels, Belgium (20 May 1980).

A recent review of the US solar energy policy concluded that solar energy could provide up to 13% of US energy consumption by the year 2000. Many experts believe that even lower goals of 10% solar penetration will be difficult and expensive to reach, even if we assume that oil costs 32 $/bbl by then (in 1977 dollars). The difficulty arises not from industry technological but economic, institutional, regulatory, and informational barriers to the early and rapid use of solar energy. However, recent estimates by the Energy Information Administration (EIA) and Booz, Allen and Hamilton Inc. indicate that, as of 1980, about 150,000 solar heating and cooling (SHAC) systems have been sold in the US since 1973, and that their current photovoltaic capacity is about 1 to 2 megawatts. This paper will focus mainly on SHAC systems because more data exists for this part of the solar market. In determining the barriers which impede the growth of solar energy systems, this paper discusses the characteristics of the building industry, the results of a market study of US SHAC installations, and looks at market economics and government policies of photovoltaics.

27260 **Industrial and economic aspects.** Valette, L.; Lauwers, D.; de Le Hoye, G. pp 63-115 of Non-technical obstacles to the use of solar energy. Strub, A.; Steemers, T.C. (eds.). New York, NY; Harwood Academic Publishers (1980).

From Symposium on non-technical obstacles to the use of solar energy; Brussels, Belgium (20 May 1980).

Results of surveys conducted in Europe on solar energy marketing are presented in this paper. The following surveys were performed: a market survey in respect to solar domestic hot water systems in Belgium; a survey of solar equipment manufacturers; a survey of representatives of the building industry; and general public surveys.

27261 **Les obstacles juridiques et fiscaux a l'utilisation de l'energie solaire.** Prieur, M. (Univ., Strasbourg, France). pp 120-147 of Non-technical obstacles to the use of solar energy. Strub, A.; Steemers, T.C. (eds.). New York, NY; Harwood Academic Publishers (1980). (In French)

From Symposium on non-technical obstacles to the use of solar energy; Brussels, Belgium (20 May 1980).

How can the law be an obstacle to the development of solar energy when solar legislation is almost nonexistent? Or is it the lack of solar legislation which is detrimental to the growth of solar equipment? First of all two fundamental questions have to be asked: What is solar energy from a legal point of view? Does it cover biomass, wind energy ... as well as direct conversion? Secondly, is solar energy to be governed by environmental law or by the law applying to other energetical resources (coal, oil, gas ...)? As for the various legal obstacles opposing the development of solar energy use, they come from different sources and have different impacts. It would be impossible to go into a detailed examination of them all. Only their main aspects will be discussed so as to allow for a comparison of the different European systems: institutional aspects (lack of proper administrative structures; research development programs and policies, utility issues); problems lying with the concept of solar access and solar right (how is solar access to be protected? Is solar energy to be considered as a res communis or as subject to individual appropriation ....); fiscal and financial aspects (nature and adequacy of these incentives, direct assistance, tax credits ...); obstacles coming from land use, and building regulations; and consumers' protection aspects. The article is written in French.

27262 Legal, fiscal, and regulatory factors. Schaeffer, G.F. (Fraunhofer-Institut fuer Systemtechnik und Innovationsforschung, Karlsruhe, Germany). pp 196-227 of Non-technical obstacles to the use of solar energy. Strub, A.; Steemers, T.C. (eds.). New York, NY; Harwood Academic Publishers (1980).

From Symposium on non-technical obstacles to the use of solar energy; Brussels, Belgium (20 May 1980).

The purpose of this report is to present an overview about fiscal, legal, and regulatory obstacles to the use of solar energy systems in Europe. It contains an outline of the major problem areas with illustrations and references to the specific situation in those countries where information was available. The report examines the problem of financing solar systems and the burden existing tax practices add to this problem. Chapter 3 focuses on planning laws and other national state and local regulations that impede the installation of solar equipment. Finally, the practice of granting building permits and the problems that arise with respect to guarantees and warranties are examined in Chapter 4.

27263 Role of an electric utility in the promotion of solar energy utilization. Castelli, G.; Massini, G. (ENEL, Rome, Italy). pp 232-245 of Non-technical obstacles to the use of solar energy. Strub, A.; Steemers, T.C. (eds.). New York, NY; Harwood Academic Publishers (1980).

From Symposium on non-technical obstacles to the use of solar energy; Brussels, Belgium (20 May 1980).

27264 Are subsidies for solar energy development justified on the basis of economic efficiency. Bezdek, R.H. (Department of the Treasury, Washington, DC); Sparrow, F.T. pp 246-271 of Non-technical obstacles to the use of solar energy. Strub, A.; Steemers, T.C. (eds.). New York, NY; Harwood Academic Publishers (1980).

From Symposium on non-technical obstacles to the use of solar energy; Brussels, Belgium (20 May 1980).

In this paper the case for subsidies for solar energy to counter inefficient pricing practices of electric utilities, hidden subsidies to nonsolar fuels, and tax law biases is examined. The conclusion reached for two of the three specific regions of the country studied for the case of solar energy replacing electricity is that far from offsetting biases against solar energy, the three collectively bias the system in favor of the use of solar energy systems. Thus, for two of the three regions studied, advocates of further subsidies must look elsewhere than economic efficiency arguments to support their position. When each bias was considered individually, it was found that inefficient pricing practices and tax law biases currently discriminate against conventional fuels in favor of solar equipment. Perhaps the most surprising result of the analysis was that when the hidden subsidies contained in the current price structure of conventional fuels for electric utilities (coal, oil, gas, and nuclear) was removed, the value of electricity freed by solar went down, rather than up, when a sufficient amount of time had passed for the utilities to adjust their capacity expansion plans to take into account the unsubsidized higher prices. This long-run result was not enough to offset the expected increase in the short-run value of electricity freed, and in all instances examined, removal of the subsidies increased the present discounted value of the stream of electricity freed by solar.

27265 Obstacle or promoter: utility involvement in nonelectric applications of solar energy. Hager, W. (European University Inst., Florence, Italy). pp 272-300 of Non-technical obstacles to the use of solar energy. Strub, A.; Steemers, T.C. (eds.). New York, NY; Harwood Academic Publishers (1980).

From Symposium on non-technical obstacles to the use of solar energy; Brussels, Belgium (20 May 1980).

The involvement of utilities in solar energy is discussed in this article. Utilities can influence the rate of diffusion of solar energy negatively and positively, directly and indirectly. Their most important indirect contribution is in the area of tariff or rate setting. They can hinder the spread of solar energy by public lobbying, or by an unhelpful or even obstructionist attitude when problems of interface between traditional and new forms of energy have to be solved. They can significantly help to accelerate the introduction of solar heating by methods ranging from consulting services to their customers to direct leasing of equipment. Examples of these attitudes and policies are presented for France, Great Britain, the Netherlands, Germany, and Italy. The author concludes that whatever their role may have been in the past, utilities can not be regarded as a major obstacle, by themselves, to the introduction of solar heating in Europe. Rather they should be regarded as potentially powerful instrument for spreading this technology.

27266 Non-technical obstacles to the use of solar energy; consumer and other aspects. Hamaker, J. pp 304-329 of Non-technical obstacles to the use of solar energy. Strub, A.; Steemers, T.C. (eds.). New York, NY; Harwood Academic Publishers (1980).

From Symposium on non-technical obstacles to the use of solar energy; Brussels, Belgium (20 May 1980).

Energy conservation programs are generally aimed at changing consumer attitudes. However, energy conscious attitudes and knowledge do not necessarily lead to a more energy conserving behavior and life style. The attitude-behavior relationships are mainly insignificant. Attitudes, it has been shown, predict energy conserving household behavior up to a maximum of 5%. On the way from attitude to behavior the first step is collecting information and digesting the information into knowledge. If the person concerned feels he is personally responsible for a part of the energy problem, all be it a very small part, and in case he expects that others will join in a conserving effort and that this will help, he may enter into a conserving behavior. In that case he has to make a choice out of many methods for energy conservation that vie for his attention. Solar energy has a high effort-low pay off quality if compared with many other conserving methods. Besides this obstacle the production and distribution of solar energy equipment do not give a guarantee for service and replacement during the life of the equipment and law does not yet protect against future obstacles that may put his collector in the shadow. The main topics of the paper are: competition in energy conservation, problems in the research, production, distribution chain, and attitude/behavior transformation.

27267 Solar-utility interface issues. Sparrow, T. (Purdue Univ., Lafayette, IN). pp 330-357 of Non-technical obstacles to the use of solar energy. Strub, A.; Steemers, T.C. (eds.). New York, NY; Harwood Academic Publishers (1980).

From Symposium on non-technical obstacles to the use of solar energy; Brussels, Belgium (20 May 1980).

Provisions of the National Energy Act which discourage utilities from participating in the commercialization of solar energy are discussed in this article. The pros and cons of utility involvement in solar commercialization are presented. Other subjects discussed include: solar only utilities; the impact of back-up rate structures; time-of-day and/or time-of-season rates; interruptable power; inversion of the declining block rate structure; the true cost of additional energy; fair treatment for solar energy; the efficiency issue; and the solar/gas interface issues.

27268 Consumer attitudes. Leijendeckers, P.H.H. pp 358-420 of Non-technical obstacles to the use of solar energy. Strub, A.; Steemers, T.C. (eds.). New York, NY; Harwood Academic Publishers (1980).

From Symposium on non-technical obstacles to the use of solar energy; Brussels, Belgium (20 May 1980).

This paper deals with the non-technical obstacles to solar water and space heating. Specifically considered are obstacles resulting from the position and the attitude of the consumer toward energy conservation and the application of solar heating systems. It is important to analyze the non-technical obstacles now, as the feeling is that the main barriers nowadays to the commercialization of solar heating systems primarily are institutional and economic rather than technological. When deciding on how to develop a successful strategy for the implementation of solar technology in our future society one has to deal with four major areas of concern. These are: (1) The development of a qualified and competitive solar industry. (2) The structure of the housing market and the existing system of subsidies. (3) The social aspects of consumer behavior. (4) The overcoming of the ignorance about costs, implementation on operation of solar systems via the dissemination of information to the general public and education of builders, developers, manufacturers and installers, county and local officials.

30 DIRECT ENERGY CONVERSION

3001 Mhd Generators

27269 **(ANL/MHD—80-9) Nitric oxide formation in multi-parallel jet secondary combustor for MHD system.** Chung, P.M.; Smith, R.S.; Haydweiller, J.; El Derini, Z. (Argonne National Lab., IL (USA)). Oct 1980. Contract W-31-109-ENG-38. 54p. NTIS, PC A04/MF A01. Order Number DE81026535.

Combustion and nitric oxide formation are analyzed for an MHD secondary combustor consisting of multi-parallel jets of air injected into a stream consisting of the primary combustor combustion product containing carbon monoxide. The minimum combustor length required for mixing and complete combustion in the limit of fast chemical kinetics is determined. This length is shorter than that required for uniform mixing. It is a moderate function of the jet spacing and is rather strongly dependent upon the stoichiometric air ratio. In the usual operating temperature range of 1600 to 2000°K and for the lengths up to about 5m, the NO/sub x/ reactions in the secondary combustors are found to be nearly frozen. Therefore, ignition and combustion, rather than the nitric oxide formation, should be the secondary combustor design criterion.

27270 **(ANL/MHD—80-17) Comparison of analytical and experimental studies of NO/sub x/ kinetics in MHD systems.** Sistino, A.J. (Argonne National Lab., IL (USA)). Feb 1981. Contract W-31-109-ENG-38. 29p. NTIS, PC A03/MF A01. Order Number DE81026479.

In an open cycle MHD-steam system, the high temperature (2800 to 3000 K) in the coal/air combustor tends to produce high NO/sub x/ levels (~ 10,000 ppM) in the combustion products. These levels must be reduced to 550 ppM for stack emission acceptable under Environmental Protection Agency regulations. In order to meet the EPA requirement, the NO/sub x/ concentration in the various system components must be determined, and certain of those components must be of new special design. These two objectives have been considered in previous works. In particular, the NO/sub x/ composition in the MHD-steam system has been determined by modeling the chemical kinetics in the diffuser, the radiant boiler and the secondary combustor. In the present report, a detailed description of the formulation of the chemical kinetics model is first given, which should aid understanding of NO/sub x/ formation/decomposition in an MHD-steam system; then the results of studies using the chemical kinetics model are compared with available experimental results.

27271 **(DOE/CH/10018—14) Heat recovery and seed recovery development project: preliminary design report (PDR).** Arkett, A.H.; Alexander, K.C.; Bolek, A.D.; Blackman, B.K.; Kurrle, P.E.; Tram, S.V.; Warren, A.M.; Ziobrowski, A.J. (Babcock and Wilcox Co., Barberton, OH (USA). Fossil Power Generation Div.). 1 Jun 1981. Contract AC02-79CH10018. 483p. (BW—10018-TR-4). NTIS, PC A21/MF A01. Order Number DE81025561.

The preliminary design and performance characteristics are described of the 20 MWt heat recovery and seed recovery (HRSR) system to be fabricated, installed, and evaluated to provide a technological basis for the design of commercial size HRSR systems for coal-fired open-cycle MHD power plants. The system description and heat and material balances, equipment description and functional requirements, controls, interfacing systems, and operation and maintenance are detailed. Appendices include: (1) recommended environmental requirements for compliance with federal and state of Tennessee regulations, (2) channel and diffuser simulator, (3) equipment arrangement drawings, and (4) channel and diffuser simulator barrel drawings. (WHK)

27272 **(DOE/CH/10018—40) Heat-recovery and seed-recovery development project: scale up to large-size system report.** Arkett, A.H.; Cusumano, J.P.; Tram, S.V. (Babcock and Wilcox Co., Barberton, OH (USA). Fossil Power Generation Div.). 1 Oct 1980. Contract AC02-79CH10018. 167p. (BW—10018-TR-3). NTIS, PC A08/MF A01. Order Number DE81025903.

In the MHD-HRSR combined-cycle plant, the heat recovery and seed recovery system (HRSR) is coupled to the MHD topping cycle which consists of the MHD combustor, the channel, super conducting magnet and the diffuser. In the HRSR system, a boiler is designed to recover the usable heat in the form of superheated steam and to collect the spent seed which condenses out of the flue gas as it is cooled down in the boiler. The boiler is a subcritical, drum type with pump assisted circulation. The heat absorption equipment in the boiler consists of the furnace, the superheaters, the intermediate temperature air heaters, the low temperature air heaters, and the economizer. A turbine-generator-condenser system is also designed to utilize superheated steam for power generation. The final solids removal will be done with an electrostatic precipitator. The combined process of preheating and oxygen enrichment of the combustion air will be utilized. The 300 MWt HRSR system that will form the basis of the design of the 20 MW test facility is described. Existing equipment and techniques in the boiler industry are applied to develop the conceptual design of the 300 MWt HRSR system. (WHK)

27273 **(DOE/ET/10805—T1(Vol.3)) Development, testing, and evaluation of MHD materials and component designs. Volume III. Electrical properties of coal combustion product. Final report, 15 October 1973-31 December 1975.** Young, W.E.; Lempert, J. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Research and Development Center). Nov 1980. Contract AC01-76ET10805. 60p. (FE—1540-29(Vol.3)). NTIS, PC A04/MF A01. Order Number DE81026201.

Initially the study on electrical properties of coal combustion product was intended to confirm the computer model and to support the design of the Waltz Mill MHD channel. Laboratory apparatus was assembled to produce a plasma identical in composition and properties to that resulting in an MHD system when coal and air are burned. This was accomplished with a combustion chamber in which benzene, char, sulfur, and seed mixtures were burned with electrically preheated air. The plasma entered a measuring section where temperatures were measured with iridium versus iridium-rhodium thermocouples, with pyrometers, and by means of line reversal. Measurements of electrical conductivity were made with current and voltage probes. Many difficulties were experienced in the operation and calibration of the equipment such as damage of materials, water leaks, and misalignment of instrumentation. However some readings were obtained in the 1900°C to 2000°C range, averaging 10 to 20 mhos/meter - much higher than predicted theoretically, probably due to electrical leakage. Finally electrical measurements were made on the Waltz Mill passage during operation. Readings less than 1.0 mhos/meter were obtained which was not unexpected because the plasma temperature approximated 2100°C.

27274 **(DOE/ET/10805—T1(Vol.4)) Development, testing, and evaluation of MHD materials and component designs. Volume IV. Development and evaluation of materials for MHD channels. Final report, 15 October 1973-31 December 1975.** Young, W.E.; Rossing, B.R. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Research and Development Center). Nov 1980. Contract AC01-76ET10805. 69p. (FE—1540-29(Vol.4)). NTIS, PC A04/MF A01. Order Number DE81026200.

A small materials test facility is described for simulating hot wall MHD channel operation with 90% coal slag removal. It was concluded that a graded CeO_2 - ZrO_2 composition offered a good possibility for a satisfactory MHD electrode with a hot-face surface temperature of 1600°C and a back-face (platinized) temperature of 1000°C. It was also concluded that a larger materials tester with a rectangular cross section and provision for passing current through the electrodes would be desirable. Such an apparatus was built for a follow-on contract.

27275 **(DOE/ET/10805—-T1(Vol.5)) Development, testing, and evaluation of MHD materials and component designs. Volume V. Combustion technology, a review for development of coal burning equipment for advanced energy conversion systems. Final report, 15 October 1973-31 December 1975.** Young, W.E.; Dilmore, J.A. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Research and Development Center). Nov 1980. Contract AC01-76ET10805. 72p. (FE—1540-29(Vol.5)). NTIS, PC A04/MF A01. Order Number DE81026199.

The Westinghouse Electric Corporation has identified a need to develop a line of combustors capable of burning coal or coal-related fuels for a variety of applications associated with advanced power generating equipment. Also required are coal preparation, handling, and feeding equipment necessary for operating the facility, as well as the completely instrumented test stand needed for evaluation and development. This facility, if constructed with government funds, could be made available to other contractors for their evaluation and development as well as to other Westinghouse groups to support in-house and government programs. The design of a complete coal banding processing and feeding system for a coal combustor is described. Also, designs for two-stage combustors for the ETF-1, ETF-2, and ETF-3 are given. (WHK)

27276 **(DOE/ET/10805—T1(Vol.6)) Development, testing, and evaluation of MHD materials and component designs. Volume VI. Cooperative effort in the Soviet U-02 materials testing facility. Final report, 15 October 1973-31 December 1975.** Young, W.E.; Frantti, E.W. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Research and Development Center). Nov 1980. Contract AC01-76ET10805. 453p. (FE—1540-29(Vol.6)). NTIS, PC A20/MF A01. Order Number DE81026198.

The first (Phase I) joint US-USSR test of US electrode materials was carried out in Moscow between September 25 and October 8, 1975 in the Soviet U-02 MHD facility. The test procedure was designed to test five different zirconia based materials and the cathode and anode electrode wall modules under MHD operating conditions. The materials which were selected were $88ZrO_2$-$12Y_2O_3$, $82ZrO_2$-$18CeO_2$, $50ZrO_2$-$50CeO_2$, $25ZrO_2$-$75CeO_2$ and $20ZrO_2$-$78CeO_2$-$2Ta_2O_5$. Each of the five electrode materials had four different current densities established between the anode and cathode during the experiment which lasted a total of 127 hours; 100 hours under MHD power operational conditions. There were also extensive tests made on the modules before their shipment to the USSR and after their installation into the U-02 channel but before the start of the 1st phase. All except six electrode pairs performed satisfactorily during the entire test. These were the pairs which were designated to carry maximum or near maximum current density. Five pairs failed early in the life test and the sixth pair failed in the last several hours. Failure was not due to the electrode materials, however, but due to lead-out melting caused by joule heating in the platinum wires. The U-02 facility is fully described and the operational parameters are given for each phase of the test. The electrode and insulating walls are described and the appropriate parameters that are used to predict the performance of the module are given. (WHK)

27277 **(DOE/ET/10805—T1(Vol.7)) Development, testing, and evaluation of MHD materials and component designs. Volume VII. MHD appendix (bibliography, patent disclosures, supplementary DWGS). Final report, 15 October 1973-31 December 1975.** Young, W.E. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Research and Development Center). Nov 1980. Contract AC01-76ET10805. 62p. (FE—1540-29(Vol.7)). NTIS, PC A04/MF A01. Order Number DE81026197.

The Appendix comprises a seven-section bibliography of nearly 200 report, memo, and technical paper listings, and includes not only those completed during the Contract 1540 time frame, but some that lead up to and are subsequent to the contract period. In addition to the bibliography, there is a listing of 66 patent disclosures (and patents) and 27 assembly drawings, including reference to the associated details.

27278 **(DOE/ET/10815—T5) Initial UTSI-MSU cooperative application of line-reversal instrumentation in a coal-fired MHD combustor.** Giel, T.V.; Baucum, W.E.; Winkleman, B.; Cook, R.L.; Bauman, L.E.; Daubach, R. (Tennessee Univ., Tullahoma (USA). Space Inst.; Mississippi State Univ., Mississippi State (USA). Engineering and Industrial Research Station). Apr 1981. Contract AC02-79ET10815. 29p. NTIS, PC A03/MF A01.

A cooperative University of Tennessee Space Institute-Mississippi State University effort was conducted to measure combustor temperatures in an open cycle coal-fired MHD generator. The Misisippi State University (MSU) sodium line reversal system was employed during runs TP40B-03, TP40B-04 and TP40B-05 of the University of Tennessee Space Institute (UTSI) Energy Conversion Facility Cell I MHD flow train. The primary test goal was evaluation of electrode cap materials and electrode capping techniques with simulated Engineering Test Facility MHD plasma composition. Reasonable success was achieved in providing over 40 minutes of durability test time. However, at the position in the combustor where optical access was provided for the line reversal measurements the sodium emission doublet could not be identified, preventing employment of the Mississippi State University sodium line reversal technique. The line reversal temperature measurement technique is described and some details of the MSU system used in the TP40B test series are presented. Results are discussed. (WHK)

27279 **(DOE/ET/11417—T1) MHD high-performance demonstration experiment interagency agreement No. ET-78-I-01-2895. Quarterly progress report, October 1-December 31, 1980.** (Arnold Engineering Development Center, Arnold Air Force Station, TN (USA)). Jan 1981. Contract AI01-78ET11417. 67p. NTIS, PC A04/MF A01. Order Number DE81023930.

The objective of this research is to demonstrate the attainment of MHD performance on a sufficiently large scale to verify that the commercial MHD concept is a viable energy alternative. An existing facility at the Arnold Engineering Development Center (AEDC) was refurbished and additional systems required for performing the experiment were designed and built. Shakedown tests of the major flow train components and the 6 Tesla cryogenically cooled magnet were complete by late 1979. Powered testing was initiated in late 1979 and approximately 50 percent of the design power was achieved before testing was interrupted due to a major electrical failure. During the period between October 1, 1980, and December 31, 1980, improvements and repair of the HPDE system have continued. The magnet bore liner was repaired and all preparations for installing the channel into the magnet bore have been made. Extensive modifications to the entire electrical system are being made. The data acquisition system is being updated and expanded. Replacement of the interelectrode insulation and renovation of the electrodes are nearing completion. The new pyrolytic graphite caps have been received and installation is progressing. All old load buckets have now been replaced and the load bank is ready for operation. Further analysis of the data obtained during the previous power production test phase has continued and computations have been made to aid in the development of the follow-on test program. Details concerning power production, enthalpy extraction, interelectrode insulator integrity, voltage drop, diagonalization, magnetic fringe fields, magnet stresses, and flange integrity are being analyzed. (WHK)

27280 **(DOE/PC/04049—T1) Operation, maintenance and modification of DOE/PETC two stage MHD pressurized coal combustor. Final activity report, July 1976-November 15, 1980.** (Management and Technical Services Co., Philadelphia, PA (USA)). 1980. Contract AC02-76PC04049. 131p. (COO—4049-18). NTIS, PC A07/MF A01. Order Number DE81025971.

The primary objective of the DOE/PETC program is to obtain definitive process information from the two-stage 5 MW MHD pressurized coal combustor to allow scaling of the combustor to 50 MW thermal for the CDIF facility to be located in the Butte, Montana area. Activities are described according to the following phases: (1) facility preparation; (2) facility start-up and operating adjustment period; (3) process investigation operations; (4) major facility scroll combustor modification; (5) scroll combustor

shakedown testing; (6) AVCO diagnostic test section redesign and installation; (7) scroll combustor testing with diagnostic test section installed; and (8) facility downmode. Diagrams and engineering drawings of the facility are included. (WHK)

3003 Thermoelectric Generators

REFER ALSO TO CITATION(S) 26942

3004 Thermionic Converters

REFER ALSO TO CITATION(S) 27285

3005 Fuel Cells

27281 **(BNL—29628) Reaction kinetics at electrodes on zirconia in H_2/H_2O gases.** Schouler, E.J.L.; Isaacs, H.S. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 4p. (CONF-810566—4). NTIS, PC A02/MF A01. Order Number DE81025068.

From International conference on fast ionic transport in solids; Gatlinburg, TN, USA (18 May 1981).

An electrochemical study has been carried out at 1000°C in different H_2/H_2O environments using single contact electrodes. Several electronically conducting materials were tested both anodically and cathodically. The currents observed over a wide range of potential depended on the concentration and ratio of hydrogen and water, the stability of the metal and the oxidation and reduction of its oxides, the evolution of oxygen and injection of electrons into the electrolyte at the most negative potentials. Specific currents (current per unit length of three-phase contact) were measured for each of the materials tested at fixed water partial pressures and -1200 mV vs air. The specific currents decreased in the order Fe > Co > Ni > Mo > La(Al,Mg)CrO_3 demonstrating the electrocatalysis of electrode surface.

27282 (CONF-801055—, pp 188-192) **Improved alkaline hydrogen/air fuel cells for transportation applications.** Srinivasan, S.; McBreen, J.; Kissel, G.; Kordesch, K.V.; Kulesa, F.; Taylor, E.J.; Gannon, E. (Brookhaven National Lab., Utpon, NY). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

Considerable progress has been made in the last few years on improvement of alkaline air electrodes for air depolarized chlor-alkali cells. Some of these electrodes from Union Carbide Corporation have been evaluated at Brookhaven National Laboratory in alkaline hydrogen/air fuel cells. In initial tests with 289 cm^2 electrodes, power densities of 100 mW/cm^2 were obtained at 0.65 V. This compares with power densities of 27 mW/cm^2 obtained by Kordesch in his vehicle fuel cell in the late sixties. Further improvements in the air electrode flow field yielded power densities of 126 mW/cm^2 at 0.65 V at an operating temperature of 70°C. At 30°C, nearly 60% of this power could be obtained at 0.65 V. The 289 cm^2 cells were units in a 16-cell 0.5 kW module. This module yielded similar power densities and its power/weight and power/volume are sufficiently attractive for it to be considered as a building block for a fuel cell power plant in a fuel cell/battery hybrid vehicle.

27283 **(DOE/ER/04445—1) Electrochemistry of carbides and carbon cathodes in molten halides. Progress report, 1980-1981.** Selman, J.R. (Illinois Inst. of Tech., Chicago (USA). Dept. of Chemical Engineering). Mar 1981. Contract AS02-77ER04445. 14p. NTIS, PC A02/MF A01. Order Number DE81025400.

Activities are reviewed including potential measurements in carbide (acetylide) containing melts and a study of activity and diffusivity of zinc in zinc-aluminum alloys. Publications are listed. (WHK)

27284 **(DOE/ET/11305—T9) Thin film fuel cell/battery power generating system. Annual report, April 1, 1978-March 31, 1979.** (Westinghouse Electric Corp., Pittsburgh, PA (USA). Research and Development Center). 30 Apr 1979. Contract AC02-76ET11305. 181p. NTIS, PC A09/MF A01.

Work on the modified lanthanum chromite interconnection (IC) proceeded in a number of areas. Toward determining the stability of the IC, oxygen ion transport mechanisms were evaluated, as well as IC stability under low oxygen partial pressures (10^{-6}t 10^{-18} atm). To produce long, continuous, 40 μm thick IC films on 0.3 m long porous support tubes, improvements were made in both the EVD apparatus and process. Porous support tubes of calcia-stabilized zirconia were produced, up to 0.3 m long, for fuel cell stack fabrication. Work on the air electrode current collector covered several areas. The high-temperature resistivity of doped indium oxide was studied at various doping levels, as a function of oxygen partial pressure. Also, other possible current collector formulations were investigated. By incorporating materials and process improvements, as well as improved porous support tubes, in the fabrication of 20 cell stacks, stack quality and performance at 400 mA/cm^2 and 1000°C have steadily improved. Measurement techniques have been refined on the fuel cell and its components. Realistic combination specimens, as fuel electrode-interconnection layers on a porous support tube, have been used to determine interconnection apparent resistivity at 1000°C. From polarization tests on fabricated fuel cell stacks, major electrical resistance contributors to the total cell resistance are the air electrode and the interconnection, with the latter being the largest contributor.

27285 **(DOE/ET/15078—T1) Results of FY 1979 project appraisal. Appendix A: fuel cells worksheets.** (Sante Fe Corp., Alexandria, VA (USA)). Mar 1979. Contract AC03-77ET15078. 202p. NTIS, PC A10/MF A01.

Worksheets are presented to show the project appraisal of each of the three technologies (phosphoric acid fuel cells, molten carbonate fuel cells, and thermionic converters) and the market penetration of the technologies in their respective market areas. In the case of the phosphoric acid fuel cell, there are two market areas which were analyzed. Those market areas coincided with the two sizes of phosphoric acid systems that are expected to be produced (4.8 MW module and the 40 kW module). The 4.8 kW module system is used for both total energy systems and industrial systems. The industrial market is comprised of industrial cogeneration, and waste utilization. Molten carbonate fuel cells and thermionic energy conversion will be used in the market areas of baseload utility electric generation and inudstrial cogeneration.

27286 **(FCR—2067) 40-kW field test power plant modification and development. Phase II. Annual report, July 1, 1978-June 30, 1979.** (United Technologies Corp., South Windsor, CT (USA). Power Systems Div.). 15 Aug 1980. Contract AC01-77ET11302. 129p. NTIS, PC A07/MF A01.

Progress on the design and development of a 40-kW fuel cell system for on-site installation for providing both thermal and electrical power is reported. Development of the steam reformer fuel processor, power section, inverter, control system, and thermal management and water treatment systems is described. (WHK)

27287 (ORNL/TM—7612, pp 134-143) **Fuel cells.** Jul 1981. NTIS, PC A09/MF A01.

In Advanced research and technology development fossil energy materials program plan for FY 1981.

Fuel cells with phosphoric acid or molten carbonate electrolytes are the ones with the greatest potential for utility applications in the near future. These two fuels cells are described in detail in this section. Materials research requirements are identified.

27288 **Electrocatalytic oxidation of hydrocarbons on a stabilized-zirconia electrolyte employing gold or platinum electrodes.** Goffe, R.A.; Mason, D.M. (Stanford Univ., CA). *Journal of Applied Electrochemistry ;* **11**: No. 4, 447-452(Jul 1981).

The electro-oxidation of those hydrocarbon fuels commonly derived from coal (e.g. CO, CH_4 and H_2) was studied using a disc of scandia-stabilized zirconia ($ZrO_2)_{0.92}(Sc_2O_3)_{0.08}$, the anodic face of which was coated with either porous platinum or gold as the

electrode material. The cathode face of the disc was coated with porous platinum and exposed to air which provided the source of oxygen. The stabilized-zirconia reactor disc was operated at 700°C and 1 atmosphere in both the self-generated-power (fuel-cell) mode and the applied-power mode. From the experimentally observed behaviour of the current-overpotential curves the electrocatalytic oxidation of hydrocarbons is found qualitatively to be independent of whether porous gold or platinum is used at the anode. This behavior indicates that the solid electrolyte itself is playing the major role in the electrocatalytic processes since platinum would be expected to be much more catalytic than gold in the electro-oxidation of these fuels. The fuel species investigated showed the following trend in the current drawn, and thus reactivity, at a given overpotential: $H_2 > CO > CH_4$. 5 figures.

27289 **Diffusion-controlled polarization of Pt, Ag, and Au electrodes with doped ceria electrolyte.** Da, Y.W.; Nowick, A.S. (Columbia Univ, New York, NY). *Journal of the Electrochemical Society ;* **128**: No. 1, 55-63(Jan 1981).

The nature of electrode polarization, previously investigated for Pt paste electrodes, is now studied for Pt foil, Ag and Au paste, and Ag foil electrodes. The current interruption method with a reference electrode is employed in the temperature range 500-800°C under O_2-Ar gas mixtures. Electrode structures are also examined by optical and electron microscopy. The principal experimental feature is that of the Butler-Volmer equation is obeyed with cathodic and anodic transfer coefficients of 1/2 and 3/2, respectively, and an effective exchange current which varies as the 3/8 power of p/sub O2/. Also, transient decay curves are much slower than for the pure charge transfer mechanism. 25 refs.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

REFER ALSO TO CITATION(S) 27224, 27225, 27226

27290 **(CONF-8010193—1) Analysis of demand in individual sectors for use in national energy planning.** Cirillo, R.R. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 36p. NTIS, PC A03/MF A01. Order Number DE81023814.

From Commission of the European Communities international conference on energy planning; Brussels, Belgium (21 Oct 1980).

The International Energy Development Program (IEDP) is an activity carried out as a cooperative effort between the US Government and selected developing countries. The program is designed to assist developing and industrializing nations in improving their capabilities to conduct comprehensive national energy planning. The cooperative efforts involve the conduct of a comprehensive assessment of a country's energy supply-and-demand options and the identification and evaluation of alternative strategies for matching the two. To date, assessments have been completed with Egypt and Peru. Studies in Argentina, Portugal, and the Republic of Korea are in process. This paper describes the analytical process used in the assessments: the projection of sectoral energy demand. Two basic activities can be identified: the data-base assembly and the integrated analysis. The data-base assembly itself is divided into a supply analysis and a demand analysis. The demand analysis consists of a macroeconomic development analysis and a sectoral-demand analysis. The latter is described in detail in the paper. Structure of the demand analysis is described and illustrations are given. (MCW)

3201 Buildings

REFER ALSO TO CITATION(S) 27194, 27198, 27227

27291 **(BNL—29606) KB-1: a model for assessment of building energy policies.** Kleeman, P.T.; Balzer, C. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 13p. (CONF-810542—4). NTIS, PC A02/MF A01. Order Number DE81025084.

From Joint meeting of the Institute of Management Sciences and Operations Research Society; Toronto, Canada (6 May 1981).

KB-1 is currently being implemented for use in assessing relative impacts of building energy policies upon energy consumption, energy-conversion technologies, energy efficiency of new-building construction, degree of conversion-device replacement and building retrofit, and generation of residuals discharged into the environment. KB-1 is formulated as a single-time-period linear program that identifies optimal investments in energy-conversion devices, building technologie, and levels of energy-resource consumption to meet exogenously specified building construction and energy-service demands in residential and commercial markets. KB-1 is specified as a multiregional model to reflect regional differences in fuel prices, fuel availability, energy-service demands, construction costs, and other differences that may affect energy decisions. KB-1 includes mathematical functions that relate energy consumption, technology choice, and quantities of generated residuals. These functions are useful in computing indicators of relative environmental impacts among alternative policies or in limiting quantities of residuals that can be generated within each region or combinations of regions. The model is partly based upon the Brookhaven Buildings Energy Conservation Optimization Model (BECOM) but has been formulated to allow analysis of a much wider range of policy options through use of parameters and decision variables different from those in BECOM. Definitions of all model parameters, decision variables, and system functions are given. The model is coded in PDS/MAGEN.

27292 **(BNL—29676) Ground energy coupling.** Metz, P.D. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 7p. (CONF-810672—21). NTIS, PC A02/MF A01. Order Number DE81024372.

From DOE heat pump contractors' program integration meeting; McLean, VA, USA (2 Jun 1981).

The goal of this research program is to determine the feasibility of ground coupling for various heat pump systems, and if feasibility is confirmed, to create comprehensive and reliable design guidelines for optimal ground coupled heat pump systems. The concept is discussed. Analytical heat flow models were developed to approximately design ground coupling devices for use in solar heat pump space conditioning systems. A digital computer program called GROCS (GRound Coupled Systems) was written to model 3-dimensional underground heat flow in order to simulate the behavior of ground coupling experiments and to provide performance predictions which have been compared to experimental results. GROCS also has been integrated with TRNSYS. Both soil thermal property experiments and 12 ground coupling device experiments are underway at BNL. The latter include 4 buried tanks, 7 serpentine earth coils in various configurations, lengths and depths, and 1 group of six sealed vertical wells. One earth soil has been used to heat a house on the BNL site with no use of resistance heating.

27293 (CONF-801055—, pp 7-10) **Simulation and evaluation of latent heat thermal energy storage heat pump systems.** Sigmon, T.W. (Research Triangle Inst., NC); Davidson, J.H.; Doster, J.M.; Martin, J.F.; Edwards, J.A. Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

A ranking analysis of six latent heat Thermal Energy Storage (TES)/Heat Pump Systems, for residential heating and cooling applications, has been completed for different climatic regions of the US. The primary basis for this evaluation was system annualized life cycle cost. Annual system performance was determined at six sites using a computer simulation of the performance of the alternative TES/Heat Pump designs. The systems considered were required to satisfy building heating and cooling loads calculated using TRNSYS under existing or proposed electricity rate structures at each simulation site. The load simulation was driven by hourly weather data provided by Sandia National Laboratory. Predetermined performance characteristics of the TES/Heat Pump systems were interfaced with the thermal loads from which energy use and cost profiles were computed. The alternative systems were compared at the different geographic locations on the basis of performance and life cycle costs and preferred systems identified for each particular climate.

27294 (CONF-801055—, pp 11-14) **Design and demonstration of a storage-assisted air conditioning system.** Rizzuto, J.E. (New York State Energy Research and Development Authority, Albany). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The design and demonstration of a residential storage-assisted air conditioning system that imposes the minimum electric demand on a utility system is discussed. The system is a peak-shaving system designed to provide a levelized air conditioning load. The system also requires minimum air conditioner and thermal storage capacity. The storage-assisted air conditioning system uses a Glauber's salt-based phase change material in sausage like containers called CHUBS. The phase change material has a thermal storage capacity in the range of 45 to 50 Btu/lb and a transition temperature of approximately 55°F. The storage-assisted air conditioning system consists of a conventional central air conditioning system (of reduced capacity), a storage bin of CHUB modules, a fan, appropriate ducting and controls. This system is being tested in a single family house on Long Island.

27295 (CONF-801055—, pp 24-27) **Crawl space-assisted heat pump.** Ternes, M.P. (Oak Ridge National Lab., TN). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

A variety of experiments and simulations have been performed or are being prepared to determine the feasibility of conditioning the source air of an air-to-air heat pump using stored ground heat or cool to produce higher seasonal COP's and net energy savings. Winter data have shown that significant preheating occurs consistently for both the single-pass and total-recycle modes, with the latter showing the better results between the two. Preliminary summer data show that precooling does occur, but that the heat pump system should be operated in the single-pass mode only. Comparison between experiments has led to the conclusion that the preconditioning is due mostly to the stored earth heat or cool and is not due in any great part to heat exchange with the house. A computer model of the crawl space has been developed, and the development of heat pump models for performance and economic studies is currently underway.

27296 (CONF-801055—, pp 31-32) **Distributed thermal energy storage in the residential sector: commercialization readiness assessment and implementation strategy.** Giese, R.F. (Argonne National Lab., IL). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The readiness of each of three candidate residential thermal energy storage systems for near-term commercialization is examined. Institutional barriers and economic and national benefits of thermal energy storage systems are enumerated. The effects of rates, standards, and capital on commercialization are discussed. A seven-element commercialization program is recommended. (LEW)

27297 (CONF-801055—, pp 159-162) **Cost-effectiveness evaluation of chemical heat pumps.** Standley, W.R.; Gorman, R.; Moritz, P.S.; O'Gorman, T.J. (TRW Energy Systems Planning Div., McLean, VA). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The DOE Office of Advanced Conservation Technologies is developing several concepts for chemical heat pumps, including those based on sulfuric acid, methanolated salts, metal hydrides, and ammoniated salts. In this project, the chemical heat pump technologies are compared with a baseline of existing HVAC technologies and a set of emerging competitive technologies. The basis for comparison is system cost effectiveness in one or more specific applications, with levelized annual cost taken as the measure of cost-effectiveness. The specific applications are a residential building and a commercial building, each requiring HVAC services, and each evaluated in Boston and Alburquerque. An industrial process-heat upgrading application is also included. For each system, the net consumption of fossil fuel resources is evaluated, and environmental/safety aspects identified.

27298 (CONF-801055—, pp 163-166) **Design and performance of a multitube metal-hydride heat pump.** Clinch, J.M.; Abelson, H.; Horowitz, J.S. (Argonne National Lab., IL). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The design of a unique multitube metal-hydride heat pump that can be cycled rapidly is described, and its performance is analyzed. Each tube contains a high-temperature hydride at one end and a low-temperature hydride at the other end. The design features a large number (above 200) of individual tubes and includes external thermal-regeneration loops to reduce the performance losses inherent in thermal cycling. The analysis models the entire heat-pump cycle and includes one typical result of a complete simulation of the regenerative heat-exchange process. A calculation is performed to predict the coefficient of performance (COP) in the heating mode for a given tubular design.

27299 **(CONF-810657—2) Compressor-simulation model with corrections for the level of suction gas superheat.** Dabiri, A.E.; Rice, C.K. (Oak Ridge National Lab., TN (USA); Science Applications, Inc., La Jolla, CA (USA)). 1981. Contract W-7405-ENG-26. 16p. NTIS, PC A02/MF A01. Order Number DE81023954.

From ASHRAE 1981 annual meeting; Cincinnati, OH, USA (28 Jun 1981).

A compressor simulation model, based on empirical performance curves from reciprocating compressor manufacturers, is discussed. The compressor model is part of a heat pump simulation model being developed for potential use in reducing the amount of testing required for air-to-air heat pumps by the new rating procedures being implemented by DOE. Corrections to the compressor performance curves (maps) are developed to account for the effect of different superheat (or quality) levels on refrigerant mass flow rate and compressor power; the corrections are in general agreement with the average of the available information from manufacturers of two- to four-ton, R-22, hermetic, reciprocating compressors. Comparisons are made between the compressor model predictions and available data from four heat pump experiments. The comparisons indicate that more experimental data are needed at the lower ambient conditions in the heating mode under conditions of wet suction gas and with lower air temperatures over the compressor shell.

27300 **(CONF-810672—8) RD and D opportunities for large heat pump systems.** Goldenberg, D. (Oak Ridge National Lab., TN (USA); TRW, Inc., Oak Ridge, TN (USA)). 1981. Contract W-7405-ENG-26. 9p. NTIS, PC A02/MF A01. Order Number DE81024138.

From DOE heat pump contractors' program integration meeting; McLean, VA, USA (2 Jun 1981).

The marketplace factors which constrain a more rapid implementation of energy conserving heating, ventilating, and air conditioning systems and system operation in commercial buildings are evaluated. The investigation concerns electric-drive, vapor compression cycle, air conditioning equipment and HVAC distribution and control systems used for the environmental conditioning of buildings. The commercial sector population of buildings used include 11 building types. System/equipment descriptions; state-of-the art energy conservation concepts; energy use and system cost comparisons; buildings/equipment populations and usage patterns; and non-technical constraints on the development and use of energy conserving systems are discussed. Research recommendations are made. (MCW)

27301 **(CONF-810672—12) Test and demonstration of a hermetic compressor seal. Phase I. Development of a Braun linear engine-driven heat-actuated heat pump.** Braun, AT. (Oak Ridge National Lab., TN (USA); Tectonics Research, Inc., Minneapolis, MN (USA)). 1981. Contract W-7405-ENG-26. 5p. NTIS, PC A02/MF A01. Order Number DE81024099.

From DOE heat pump contractors' program integration meeting; McLean, VA, USA (2 Jun 1981).

The objectives of the two projects are to develop and demonstrate a viable hermetic seal; to advance the state of development, through analyses, simulation, design, fabrication and testing, of the key elements and components of the Braun linear engine/compressor so that it becomes a sound basis for a reliable light-commercial-sized heat pump system; to develop and evaluate integral heat recovery and defrost systems; to develop necessary controls; and to develop preliminary prototype heat pump system specifications. The concept, technical accomplishments, and future activities are summarized.

27302 (CONF-810672—15) Advanced electric residential heat pump. Veyo, S.E. (Oak Ridge National Lab., TN (USA); Westinghouse Research and Development Center, Pittsburgh, PA (USA)). 1981. Contract W-7405-ENG-26. 8p. NTIS, PC A02/MF A01. Order Number DE81024134.

From DOE heat pump contractors' program integration meeting; McLean, VA, USA (2 Jun 1981).

The heat pump concept being developed uses the vapor compression refrigeration cycle with R22 as the working fluid. In order to achieve the target efficiency an improved reciprocating compressor with modulatable capacity is being developed along with higher efficiency air movers, a breadboard microprocessor based control system and higher effectiveness heat exchangers. The relative proportions of the compressor, blower, fan, and heat exchangers are specified through system optimization to minimize annual ownership cost while constrained to provide comfort. The key to the potential commercial success of this system is the development of low cost compressor capacity modulation means. A compressor has been developed that uses an eccentric cam between crank pin and connecting rod to change the stroke of the piston upon a reversal in the direction of crankshaft rotation. The efficiency of this compressor is comparable to the best available while the ratio of minimum to maximum capacity can be selected as a parameter of optimization. The incremental cost of this compressor is estimated to be one third that of the compressor with two speed drive motor. An indoor blower 50% more efficient and an outdoor fan twice as efficient as current practice have been designed, built, and tested. A breadboard system has been built and is being tested to verify our analytical performance estimates and to develop the control software. A dual stroke compressor system has been optimized for DOE Region V. The estimated performance exceeds the target in DOE climate regions II, III, IV, and V and the estimated installed price is approximately 5% less than the heat pump of comparison. It is estimated that the heat pump will yield a HSPF of 8.0 and a SEER of 11.23 in Minneapolis and an HSPF of 9.5 and a SEER of 11.33 in Nashville. Analysis projects the 1990 market to be greater than 680,000 units.

27303 (CONF-810672—18) Low-grade-heat-actuated absorption heat pumps for temperature boosting. Grossman, G.; Perez-Blanco, H. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE81024982.

From DOE heat pump contractors' program integration meeting; McLean, VA, USA (2 Jun 1981).

The present study has resulted in a conceptual design of the heat pump system providing the information needed for the detailed design and construction of a laboratory working system. The basic cycle was studied for use with low-temperature waste heat (60°C). Multistaging of the heat pump was investigated for increased temperature boosting and a preferred two-stage configuration was identified. Open cycle evaporation and desorption was considered for cases of low temperature differential between the heat source and sink. Suitable working materials were considered and components performance was analyzed at the conceptual design level. The overall system performance was studied for varying operating conditions. Several improvements in the cycle were considered. A complete computer model of the system was developed to perform the study. The code is available for investigation of different configurations and operating conditions, and will be used in the detailed design of the laboratory system. Technical accomplishments are summarized.

27304 (CONF-810697—1) Development of a high efficiency, automatic defrosting refrigerator-freezer. Topping, R.F.; Lee, W.D. (Oak Ridge National Lab., TN (USA); Little (Arthur D.), Inc., Cambridge, MA (USA)). 1981. Contract W-7405-ENG-26. 15p. NTIS, PC A02/MF A01. Order Number DE81024115.

From Towards superior energy management in refrigerated and frozen foods conference; Cincinnati, OH, USA (30 Jun 1981).

The development of an energy-efficient refrigerator-freezer prototype to accelerate the commercialization of residential, high-efficiency refrigerator-freezers is described. The resulting 16-cubic-foot-prototype uses significantly less energy than the most energy-efficient automatic defrost product designs of comparable size on the market today. A computer model was developed to simulate the cabinet and refrigeration unit performance. It was used to evaluate alternative designs and optimize the cabinet insulation as well as the refrigeration component integration. Computer-optimized placement of polyurethane foam insulation in the cabinet and thicker insulation in the doors were used to reduce the closed-door heat load of the prototype. Modifications to the evaporator system provide fully automatic frost-free operation with a significantly reduced defrost energy requirement compared to a typical automatic defrost refrigerator-freezer. Resulting higher moisture levels in the refrigerator compartment enhance fresh food storage. In addition, a dual control system, different from most models which use only one active control, provides precise temperture regulation in both the freezer and refrigerator compartments.

27305 (CONF-8010146—, pp 21-30) Delivering energy services. Bradley, B. (US Senate, Washington, DC). Jan 1981. NTIS, PC A08/MF A01.

From Utilities and energy efficiency: new opportunities and risk; Port Chester, NY, USA (23 Oct 1980).

The Residential Energy Efficiency Plan, designed to tap the initiatives of the private sector to systematically capture the millions of Btus wasted in residential buildings, is discussed. Authorizing legislation, as part of the Energy Security Act of 1980, included the demonstration of 4 residential energy-efficiency plans (REEP) throughout the US. A pilot test of REEP, which began in New Jersey in the summer of 1979 is noted. The following entities would participate directly in a residential energy-efficiency program: (1) a private energy-conservation company; (2) a natural gas utility and an electric utility; (3) a state or local governmental unit having jurisdiction over the gas and electric utility; (4) local suppliers and installers of energy conservation measures; and (5) individual home-owners and renters of multifamily dwellings. How it works and the benefits of the program are described.

27306 (DOE/EIA/0207—5) Residential energy-consumption survey: consumption and expenditures, April 1978-March 1979. (Department of Energy, Washington, DC (USA). Office of Consumption Data System). Jul 1980. 237p. NTIS, PC A11/MF A01. Order Number DE81025645.

Tables present data on energy consumption and expenditures for US households during a 12-month period. The total amount of energy consumed by the residential sector from April 1978 through March 1979 is estimated to have been 10,563 trillion Btu with an average household consumption of 138 million Btu. Table 1 summarizes residential energy consumption for all fuels (totals and averages) as wells as total amounts consumed and expenditures for each of the major fuel types (natural gas, electricity, fuel oil, and liquid petroleum gas). Tables 2 and 3 give the number of households and the average energy prices, respectively, for each of the major fuel types. In Tables 4 to 9, totals and averages for both consumption and expenditures are given for each of the major fuels. The consumption of each fuel is given first for all households using the fuel. Then, households are divided into those that use the fuel as their main source of heat and those using the fuel for other purposes. Electricity data (Tables 5 to 7) are further broken down into households that use electricity for air conditioning and those not using it for this purpose. Limited data are also presented on households that use each of the major fuels for heating water. Each of the consumption tables is given for a variety of general household features, including: geographical, structural and physical, and demographic characteristics. Tables 10 to 18 present the same information for the subgroup of households living in single-family owner-occupied detached houses. The third set of tables (19 to 27) is limited to house-

holds that paid directly for all of the energy they used. Tables 28 to 36 provide variance estimates for the data.

27307 **(DOE/TIC—1018826) Residential-conservation service program final rule.** (Department of Energy, Washington, DC (USA)). Oct 1979. 354p. NTIS, PC A16/MF A01.

10 CFR Part 456 is amended by deleting Paragraph 456.000 and establishing new subparts. Subpart A contains the regulations to implement Part I of Title II of NECPA. NECPA requires the establishment of utility programs to encourage and facilitate the installation of energy conservation measures and renewable resource measures. Additional subparts are B, preparation, submission, and approval of state plans and temporary programs; C, content of state plans; D, nonregulated utility plans; E, supply, installation, and financing by utilities; F, federal standby authority and enforcement provisions; G, renewable resource installation and material standards; H, energy conservation material standards; I, energy conservation installation standards. (MCW)

27308 **(LA—8837-MS) Heat-loss factors for single-family homes.** Thayer, M. (Los Alamos National Lab., NM (USA)). May 1981. Contract W-7405-ENG-36. 36p. NTIS, PC A03/MF A01. Order Number DE81026806.

Home heat-loss factors are developed for 220 locations in the contiguous United States. Heat-loss factors serve as a basic input to the Los Alamos National Laboratory/University of New Mexico solar economic performance model (EASE III). Maximum allowable static building (residence) heat-loss factors (specified in Btu/Degree Days/ft^2 of residence units) are estimated by using the Model Code for Energy Conservation in New Building Construction. Heat-loss factors are estimated for three single-family residence types: a ranch-style slab, on-grade, single-story home; a two-story home built over a full unheated basement; and a single-story home built over a partially heated basement. Procedures and parameters used in the estimation of the heat-loss factors are described in detail. Estimated values for the heat-loss factors are presented for each of the three residence types in all 220 regions.

27309 **(LBL—10852) Measurement of infiltration using fan pressurization and weather data.** Sherman, M.H.; Grimsrud, D.T. (Lawrence Berkeley Lab., CA (USA)). Oct 1980. Contract W-7405-ENG-48. 62p. (CONF-801019—2). NTIS, PC A04/MF A01. Order Number DE81025211.

From 1. International Energy Agency symposium of the air infiltration centre; Windsor, UK (6 Oct 1980).

A technique using the results of fan pressurization and weather data to calculate infiltration is presented. The geometry, leakage distribution, and terrain and shielding classes are combined into two reduced parameters which allow direct comparison of wind-induced and temperature-induced infiltration. Using these two parameters and the total leakage area of the structure (which is found from fan pressurization) the infiltration can be calculated for any weather condition. Experimental results from fifteen different sites are presented for comparison with theoretical predictions.

27310 **(NBSIR—80-2140-Vol.1) Fire safety of wood-burning appliances, Part 1: state of the art review and fire tests. Volume 1.** Peacock, R.D.; Ruiz, E.; Torres-Pereira, R. (National Bureau of Standards, Washington, DC (USA). Center for Fire Research). Nov 1980. Contract AI01-76ET29265. 79p. NTIS, PC E04/MF $3.50.

A series of 18 full-scale tests was conducted in an instrumented test room using five different wood-burning appliances. These tests were designed (1) to establish typical operating conditions including temperatures on the appliances, chimneys, and adjacent combustible surfaces; (2) to study the effects of a variety of combinations of appliance design, clearance to combustibles, and room construction on temperatures on adjacent combustible surfaces; and (3) to compare these measured values with theoretical predictions of wall surface temperature. Additional tests were conducted to compare a standardized fuel source with typical oak logs. A review of literature related to wood-heating safety included in this study revealed that current codes are based on data almost 40 years old. The results of these tests point out some areas where the codes should be modernized to accurately reflect the newer appliances and construction techniques.

27311 **(SAI—444-80-325-LJ) Technical integration of energy efficiency standards activity for dishwashers, television sets, clothes washers, humidifiers, dehumidifiers and heat pumps.** (Science Applications, Inc., La Jolla, CA (USA)). 28 Mar 1980. Contract AC03-79CS10757. 33p. NTIS, PC A03/MF A01.

Plans for providing technical support to DOE on the evaluation of energy efficiency standards of the appliances are described. The major objectives of the effort, followed by a brief description of the major tasks and subtasks that have been defined to meet these objectives are outlined. A program schedule is presented showing the duration of each task with major milestones and deliverables. Time phased expenditures are plotted for each task.

27312 **(SAI—444-80-331-LJ) Consumer products minimum energy efficiency standards program. Topical report on Subtask 3.1. Clothes washer and dishwasher energy consumption models.** (Science Applications, Inc., La Jolla, CA (USA)). Apr 1980. Contract AC03-79CS10757. 54p. NTIS, PC A04/MF A01.

Two computer programs which were written to aid in the energy efficiency analysis of clothes washers and dishwashers are documented. These programs compute the energy consumption and efficiency factors of these appliances and also evaluate selected design improvements with regard to their impact on energy consumption. The methods of calculation, the modeling technique for the design improvements, the required inputs, and a sample run are presented for the appliances. (MCW)

27313 **(SAI—444-80-356-LJ) Consumer-products minimum energy-efficiency-standards program. Topical report on Subtask 3.1. Evaluation of energy consumption savings of boost heaters in dishwashers.** (Science Applications, Inc., La Jolla, CA (USA)). May 1980. Contract AC03-79CS10757. 28p. NTIS, PC A03/MF A01.

An analysis of the energy conservation and life cycle cost benefits of boost heaters for dishwashers is presented to provide technical information to assist in determining whether to modify the dishwasher test procedure to include boost heaters. Two manufacturers are offering dishwashers which have an inlet water temperature requirement of 120°F. Cleaning performance in these appliances is maintained with an electric coil in the sump of the dishwasher, which boosts the incoming water to its final temperature. Both manufacturers have petitioned DOE for exemption from efficiency standards, since current DOE test procedures give no credit for water heater energy savings. The evaluation shows boost heaters to be energy conserving for all conditions. The life cycle cost analysis indicates boost heaters are cost effective in all cases for homes with electric water heaters, and in most cases for homes having gas water heaters. Additionally the proposed standards for dishwashers will lower water consumption in 1985 model dishwashers such that boost heaters will become cost effective in all cases.

27314 **(SAI—444-80-457-LJ) Energy consumption testing of television sets. Consumer products minimum energy efficiency standards program, topical report.** (Science Applications, Inc., La Jolla, CA (USA)). 20 Nov 1980. Contract AC03-79CS10757. 73p. NTIS, PC A04/MF A01.

In order to determine both energy consumption vs picture tube size and energy consumption variation for a given picture tube size, field testing of 200 current model television sets was conducted from May to July 1980 in place in appliance stores in the San Diego area. The data collected determined the relationship between tube size and energy factor for inclusion in the DOE test procedure, the difference in energy consumption between the most efficient and least efficient sets of each size, and assisted in the study of differences in energy consumption as a function of set design improvements. The samples tested represent both domestic and imported television sets. In response to questions concerning the suitability of the signal generator used in tests run from May to July 1980, additional tests were run in October 1980. These tests confirmed the accuracy of the original tests upon which this report is based. Test plan, testing procedure, and results are presented.

27315 (SAI—444-80-473-LJ) Heat pump seasonal performance model (HPSPM) data bases. (Science Applications, Inc., La Jolla, CA (USA)). 28 Aug 1980. Contract AC03-79CS10757. 54p. NTIS, PC A04/MF A01.

A compilation is presented of the heat pump models and site weather data included as data bases for the Heat Pump Seasonal Performance Model (HPSPM) that has been used for recent studies of heat pump seasonal performance. Tables in Section 2.0 are performance maps of the heat pump models in the HPSPM data base. Tables in Section 3.0 present dry-bulb temperature distributions for the sites in the HPSPM data base for three types of heating season approximations (annual, six-month heating season, and estimated heating season). Section 4.0 presents tables for defrost region relative humidity statistics for the sites in the HPSPM data base for three types of heating season approximations (annual, six-month heating season, estimated heating season). Section 5.0 presents tables for the detailed heating season weather data actually entered in HPSPM for annual, six-month heating season, and estimated heating season. (MCW)

27316 (SAI—444-80-503-LJ) Comments on the DOE heat-pump test procedures and the demand-defrost results of U. Bonne. (Science Applications, Inc., La Jolla, CA (USA)). 27 Aug 1980. Contract AC03-79CS10757. 38p. NTIS, PC A03/MF A01.

Several subjects that relate to the DOE Test Procedures for heat pumps are discussed. The first of the subjects is testimony by Ulrich Bonne that contests the demand defrost control system credit of the Test Procedures. The results of Bonne's analyses are the opposite of those obtained by SAI using the Heat Pump Seasonal Performance Model (HPSPM). The causes of the differences are discussed in Section 2, Comments on the Demand Defrost Results of Ulrich Bonne. Section 3 discusses the Test Procedure heating season weather data as compared to the HPSPM weather data and NOAA weather data. Section 4 discusses the annual heating requirements determined by Test Procedure calculations as compared to HPSPM and other results; and Section 5 discusses the Test Procedure heating season load models as compared to the HPSPM loads. Conclusions are summarized.

27317 (SAI—444-80-563-LJ) Investigation of existing heat-pump defrost test data. Topical report Subtask 4.1. Consumer Products Minimum Energy Efficiency Standards Program. (Science Applications, Inc., La Jolla, CA (USA)). 3 Oct 1980. Contract AC03-79CS10757. 126p. NTIS, PC A07/MF A01.

An effort to seek and identify information on performance of heat pumps with on and off cycles and performance during frost buildup and defrost conditions is described. The methodology for obtaining data and information is described. Synopses of literature found to be pertinent are presented in Appendix A. Results of information sought and obtained by telephone are presented in Section 5 and recorded in Appendix B. It is concluded that none of the data obtained is suitable for detailed comparison of the several correlating relationships for frost buildup and defrost data. (MCW)

27318 Mineral insulation: a critical study. Winer, A.A.; Wang, S.B. Ottawa, Ontario; CANMET-Energy Mines and Resources Canada (1980). 33p. (CANMET—80-11E).

The Canada Centre for Mineral and Energy Technology (CANMET) involved in a project on mineral insulation, conducted a critical study of the literature and field trips to industry have been made and discussions held with experts in insulation technology. Composition of the inorganic mixture and temperature both influence glass structure, and structure in turn determines glass properties. Important parameters in fiberizing the glass are viscosity, temperature, surface tension, and density. Phase equilibria diagrams are very useful in determining optimum composition and correct fiberizing temperature. Most mineral producers in Canada use the cupola melting furnace and wheel spinning process but the electric furnace is becoming more popular because of its inherent advantages such as the ability to use a finer and therefore more homogeneous charge; it is also more easily controlled and inhibits environmental pollution. In electric melting, electrical conductivity is an important parameter and is related to the degree of ionization. Tests are performed on mineral insulation products to satisfy standards established for applications in industry, building, and homes. Such standards are not all uniform across the country but may vary according to local requirements.

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REFER ALSO TO CITATION(S) 27345

27319 (CONF-8010194—1) Environmental implications of the large-scale utilization of alcohol fuels in the United States. Bevilacqua, O.M.; Bernard, M.J. III. (Argonne National Lab., IL (USA); OMB Associates, Oakland, CA (USA)). Oct 1980. Contract W-31-109-ENG-38. 9p. NTIS, PC A02/MF A01. Order Number DE81023906.

From 4. international symposium on alcohol fuels technology; Guaruja, Brazil (Oct 1980).

This paper highlights the most-significant findings of a major study undertaken to assess the environmental impacts - both positive and negative - associated with the large-scale utilization of alcohol/gasoline blends and neat alcohol fuels for powering highway vehicles in the United States. In this assessment, the environment was considered to include natural resource, ecological, physical environment, health and safety, and social-economic systems. The environmental assessment was based on the extrapolation and systematic analysis of existing data as to the characteristics of alcohol fuels and their performance in conventional engines. The major results and implications of this assessment are presented.

27320 (DOE/CS/51381—T3) Investigation of demonstration site and commercialization potential of new and planned pipelines. Task I. (General Electric Co., Cincinnati, OH (USA). Advanced Energy Programs Dept.). 23 Jun 1980. Contract AC03-77CS51381. 72p. NTIS, PC A04/MF A01. Order Number DE81023596.

The US DOE has a program for demonstrating the economic feasibility of using the organic bottoming cycling to save energy in the operation of gas pipelines. The bottoming cycle would recover energy from the exhaust of gas turbines used to drive pipeline compressors and would use the recovered energy as auxiliary input to the compressors. In this study of alternate demonstration sites, new sites located on the Trailblazer, Alaskan and Northern Border Pipelines were considered. Two additional existing sites at Clifton, Kansas and Syracuse, Nebraska were also considered. The studies consisted of a differential economic analyses of first-of-a-kind installations between a gas turbine with bottoming cycle and a larger gas turbine without bottoming cycle. The Clifton site was removed from study early by the pipeline company. However, the economics of the Syracuse site were superior to those of the new sites. The reason for that was that for an existing site only the bottoming cycle apparatus had to be purchased whereas for a new site the gas turbine to be bottomed had to be purchased in addition. Although the Syracuse site appeared to present an attractive investment opportunity and the pipeline company was evaluating the provided study data, the site had to be ruled out because the maintenance costs for the existing gas turbines were becoming excessive. Attention was then turned to the two sites of three studied previously which had the potential of being economically viable for production quantities of bottoming cycle apparatus. The recommendation was made that the demonstration of the bottoming cycle be accomplished at the Burney, California site because it was superior to the Rayne site economically.

27321 (DOE/CS/52184—T4) Technical analysis support for transportation energy conservation division of DOE. Fifth progress report for December 1978. (Aerospace Corp., El Segundo, CA (USA)). 10 Jan 1979. Contract AC03-78CS52184. 48p. NTIS, PC A03/MF A01.

Brief summaries of status and progress through December 31, 1978 are presented for the following support activities: heat engine systems; alternative fuels utilitization; nonhighway transport systems; new concepts evaluation; electric and hybrid vehicle research and development. Job orders initially selected and assigned to current and prospective support needs are summarized. Historical information concerning task assignments and reporting activities is provided in Appendices A and B. (MCW)

27322 **(DOE/CS/52184—T5) Technical analysis support for Transportation Conservation Division of DOE. Ninth progress report, April 1979.** (Aerospace Corp., El Segundo, CA (USA). Eastern Technical Div.). 10 May 1979. Contract AC03-78CS52184. 52p. NTIS, PC A04/MF A01.

The Aerospace Corporation is providing technical analysis support services to the DOE Transportation Energy Conservation Division. The work to be performed by The Aerospace Corporation for the DOE/TEC is confined to the following basic task areas: (1) technical support of ongoing research and development programs in energy efficient transportation systems; (2) analysis for the future commercialization of transportation technologies; (3) new concept evaluation program support; (4) technical evaluation of new concepts, inventions, and ideas; (5) assessment of technological and other factors on the implementation and utilization of transportation in the United States; and (6) program planning analysis and documentation. Progress is reported in the areas of heat engine systems, alternative fuels utilization, nonhighway transport systems, and electric and hybrid vehicles. (WHK)

27323 **(DOE/CS/52184—T6) Technical analysis support for Transportation Energy Conservation Division of DOE. Seventh progress report for February 1979.** (Aerospace Corp., El Segundo, CA (USA). Eastern Technical Div.). 10 Mar 1979. Contract AC03-78CS52184. 47p. NTIS, PC A03/MF A01.

The work to be performed by The Aerospace Corporation for the DOE/TEC is confined to the following basic task areas: (1) technical support of ongoing research and development programs in energy efficient transportation systems; (2) analysis for the future commercialization of transportation technologies; (3) new concept evaluation program support; (4) technical evaluation of new concepts, inventions, and ideas; (5) assessment of technological and other factors on the implementation and utilization of transportation in the United States; and program planning analysis and documentation. Brief summaries of status and progress are given for those support activities in progress through February 28, 1979. (WHK)

27324 **(DOE/CS/52184—T7) Technical analysis support for Transportation Energy Conservation Division of DOE. Eleventh progress report for June 1979.** (Aerospace Corp., El Segundo, CA (USA). Eastern Technical Div.). 10 Jul 1979. Contract AC03-78CS52184. 56p. NTIS, PC A04/MF A01.

The work to be performed by The Aerospace Corporation for the DOE/TEC is confined to the following basic task areas: (1) technical support of ongoing research and development programs in energy efficient transportation systems; (2) analysis for the future commercialization of transportation technologies; (3) new concept evaluation program support; (4) technical evaluation of new concepts, inventions, and ideas; (5) assessment of technological and other factors on the implementation and utilization of transportation in the United States; and (6) program planning analysis and documentation. Brief summaries of status and progress are given for those support activities in progress through June 30, 1979. (WHK)

27325 **(DOE/CS/52184—T8) Technical analysis support for Transportation Energy Conservation Division of DOE. Tenth progress report for May 1979.** (Aerospace Corp., El Segundo, CA (USA). Eastern Technical Div.). 10 Jun 1979. Contract AC03-78CS52184. 53p. NTIS, PC A04/MF A01.

The work to be performed by the Aerospace Corporation for the DOE/TEC is confined to the following basic task areas: (1) technical support of ongoing research and development programs in energy efficient transportation systems; (2) analysis for the future commercialization of transportation technologies; (3) new concept evaluation program support; (4) technical evaluation of new concepts, inventions, and ideas; (5) assessment of technological and other factors on the implementation and utilization of transportation in the United States; and (6) program planning analysis and documentation. The status of achieved progress through the period ending May 31, 1979 is presented; and the expenditure status is summarized. (WHK)

27326 **(DOE/CS/52184—T9) Technical analysis support for Transportation Energy Conservation Division of DOE. Eighth progress report for March 1979.** (Aerospace Corp., El Segundo, CA (USA). Eastern Technical Div.). 10 Apr 1979. Contract AC03-78CS52184. 48p. NTIS, PC A03/MF A01.

The work to be performed by The Aerospace Corporation for the DOE/TEC is confined to the following basic task areas: (1) technical support of ongoing research and development programs in energy efficient transportation systems; (2) analysis for the future commercialization of transportation technologies; (3) new concept evaluation program support; (4) technical evaluation of new concepts, inventions, and ideas; (5) assessment of technological and other factors on the implementation and utilization of transportation in the United States; and (6) program planning analysis and documentation. The status of achieved progress through the period ending March 31, 1979, is presented, and the expenditure status is summarized. (WHK)

3203 Industry And Agriculture

REFER ALSO TO CITATION(S) 26796, 26797, 27010, 27010, 27251, 27318, 27320, 27341

27327 **(ANL/OEPM—81-2) Evaluation of the alkaline electrolysis of zinc.** Meisenhelder, J.H.; Brown, A.P.; Loutfy, R.O.; Yao, N.P. (Argonne National Lab., IL (USA)). May 1981. Contract W-31-109-ENG-38. 35p. NTIS, PC A03/MF A01. Order Number DE81027172.

The alkaline leach and electrolysis process for zinc production is compared to the conventional acid-sulfate process in terms of both energy saving and technical merit. In addition, the potential for industrial application of the alkaline process is discussed on the basis of present market conditions, possible future zinc market scenarios, and the probability of increased secondary zinc recovery. In primary zinc production, the energy-saving potential for the alkaline process was estimated to be greater than 10%, even when significantly larger electrolysis current densities than those required for the sulfate process are used. The principal technical advantages of the alkaline process are that it can handle low-grade, high-iron-content or oxidized ores (like most of those found in the US) in a more cost- and energy-efficient manner than can the sulfate process. Additionally, in the electrowinning operation, the alkaline process should be technically superior because a dendritic or sponge deposit is formed that is amenable to automated collection without interruption of the electrolysis. Also, use of the higher current densities would result in significant capital cost reductions. Alkaline-based electrolytic recovery processes were considered for the recycling of zinc from smelter baghouse dusts and from the potential source of nickel/zinc electric-vehicle batteries. In all comparisons, an alkaline process was shown to be technically superior and, particularly for the baghouse dusts, energetically and economically superior to alternatively proposed recovery methods based on sulfate electrolysis. It is concluded that the alkaline zinc method is an important alternative technology to the conventional acid zinc process. (WHK)

27328 (CONF-801055—, pp 137) **Applications of thermal energy storage to waste heat recovery in the food processing industry.** Trebilcox, G.J.; Lundberg, W.L. Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

A demonstration project has been proposed by Heinz USA whose purpose is: to design, install and place in operation a waste heat recovery system employing thermal energy storage that will recover heat from food system waste water; to monitor the operation of the waste heat recovery system in a production setting over a period of one year, to assess its performance and to evaluate the benefits that accrue environmentally and in the form of dollar and fossil fuel savings; to effectively inform the food industry, particularly the canning segment, concerning the actual costs and benefits of system operation and to encourage industry acceptance and implementation of the system concept; to recommend a plan for system implementation in the food processing industry.

27329 (CONF-801055—, pp 150-153) **Sulfuric acid/water chemical heat pump/energy storage program.** Clark, E.C.; Carlson, D.K.; Morgan, O.M. (Rocket Research Co., Redmond, WA). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

Temperature enhancement of industrial waste heat streams (industrial heat pumping), and heating and cooling of buildings with energy storage appear to be promising applications of the sulfuric acid water chemical heat pump system presently under development. The current project is structured to verify these capabilities and to enhance near-term commercialization. To this end, a large-scale verification test unit has been designed which incorporates many commercial mass producible design features and materials. The nominal storage capacity is 10^6 Btu, with a power rating equal to 150,000 Btu/hr. The unit is scheduled to be constructed and tested closed loop during 1981. An engineering model chemical heat pump/chemical energy storage system has been designed, fabricated, and tested closed loop with a nominal 25,000 Btu/hr charge and discharge rate and 150K to 300K Btu storage capacity, depending on the number of tanks. Preliminary testing of commercial grade acid plumbing and valves is complete with no equipment failures. Testing is continuing to study component life and system configuration.

27330 **(DOE/CE—0013) Agriculture and Food Processes Branch program summary document.** (Department of Energy, Washington, DC (USA). Office of Industrial Programs). Jun 1981. 83p. NTIS, PC A05/MF A01. Order Number DE81026328.

The food industry, its energy consumption, and its energy conservation targets are discussed. Activities of the Agriculture and Food Processes Branch are described. Summaries of research, development, and demonstration programs of the Branch are given. The programs are categorized into the following: energy integrated farm systems; irrigation systems; crop drying systems; fertilizer; dairy and milk processing; meat processing; sugar processing; citrus processing; ethanol production; food processing efficiency systems; and food sterilization. Summaries are presented of 26 completed projects. (MCW)

27331 **(DOE/CS/40037—T2) Pulverized-coal firing of aluminum-melting furnaces. Quarterly technical progress report, October 1-December 31, 1979.** West, C.E. (Aluminum Co. of America, Alcoa Center, PA. Alcoa Labs.). Oct 1980. Contract AC01-78CS40037. 56p. NTIS, PC A04/MF A01.

Progress is reported on the demonstration program of an efficient, environmentally acceptable coal firing process suitable for implementation on melting furnaces in the aluminum industry. Specific tasks reported on are: design of Burner A, process equipment design and layout, purchase of process equipment, and fabrication of Burner A. The status report on Phase I data deliverables and a cost summary are presented. (MCW)

27332 **(DOE/CS/40037—T3) Pulverized coal firing of aluminum-melting furnaces. Second annual technical progress report, July 1979-June 1980.** West, C.E.; Stewart, D.L. Jr. (Aluminum Co. of America, Alcoa Center, PA. Alcoa Labs.). 1980. Contract AC01-78CS40037. 30p. NTIS, PC A03/MF A01.

Progress is reported on the demonstration program of an efficient, environmentally acceptable coal firing process suitable for implementation on melting furnaces in the aluminum industry. Specific tasks reported on are: design of Burner A; purchase of stack gas sampling instrumentation; process equipment and layout; purchase of process equipment; fabrication of Burner A; installation of process equipment; design of slag handling system and fabrication of slag handling system. The status report on Phase I data deliverables and amendment/modification to the contract are given. (MCW)

27333 **Energy use in the New Zealand fishing industry.** Riepen, M.J. Auckland, New Zealand; Univ. of Auckland (1981). 46p. (NZERDC—60-Vol.1).

The study evaluates the total energy resource commitment for the existing fishing industry structure through all its stages. The catching, processing, storage, distribution, and retail sectors are described. Consumption of conventional energy supplies and the prospects for using other liquid fuels as alternatives are discussed. (MCW)

27334 (ORNL/TM—7612, pp 99-119) **Heat engines and heat recovery.** Jul 1981. NTIS, PC A09/MF A01.

In Advanced research and technology development fossil energy materials program plan for FY 1981.

This section includes discussions of metals and ceramics for use in high-temperature turbine applications and the application of structural ceramics as the principal structural component of high-temperature, efficient heat exchangers. Some needs and programs to satisfy these needs for metallic turbine and heat exchanger materials are discussed in Section 6, Combustion Systems, of this plan. Because metals are discussed in that section, emphasis in this section is focused on structural ceramics.

27335 **Distillers grains.** Klopfenstein, T. (Univ. of Nebraska, Lincoln). pp 14p, Paper 7 of Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

Distillers dried grains are a good source of bypass protein, having a value of at least 173% that of soybean meal protein. Solubles have little bypass value. Fifty percent of the cost of the initial grain can be recovered in the byproducts if bypass is assumed equal to soybean meal while 69% is recovered using 173% the value of soybean meal. Wet distillers byproducts have a low pH (4.0) and rapidly mold. Wet grains can be ensiled if the pH is raised with ammonia or lime and a palatable product is produced. Wet and ensiled grains appear to have feeding equal to the dried byproduct.

27336 **Industrial energy thrift scheme.** London, England; Dept. of Industry (1981). 22p. (NP—1903682).

The way energy is used in factories in the six sectors which produce engineers' small tools and gauges, hand tools and implements, cutlery, bolts, nuts, screws, rivets and other industrial fasteners, wire and wire products, cans and metal boxes and wasteful practices were observed, which, if rectified, could save nearly 15% of the energy consumed. Data were analyzed for space heating, energy supplied per employee, energy consumed related to area and time, and energy consumption in the wire sector. Opportunities to save energy were identified in the boiler plant, space heating, services, and processing. (MCW)

27337 **Energy use in the steelfoundry industry.** London, England; Dept. of Industry (1981). 42p. (NP—1903683).

An examination of energy use in the manufacture of steel castings by both the conventional sand foundries and investment foundries is described. A visit to 28 foundries indicates possible savings in arc furnace practice, induction furnace melting, ladle heating, moulding and coremaking, fettling and cleaning, heat treatment, extraction and ventilation, space heating, compressed air usage, lighting, and power supply usage. Barriers to the implementation of energy-conserving measures are discussed. (MCW)

3206 Municipalities And Community Systems

27338 (CONF-801055—, pp 129-132) **Application of thermal energy storage to process heat recovery in the aluminum industry.** Katter, L.B. (Rocket Research Co., Redmond, WA). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

This project is directed toward determining the economic viability and institutional compatability of a district heating system that uses waste heat from an aluminum plant as the source of thermal energy. The project has been designed to show how existing energy storage techniques can enhance the utility of low temperature waste heat streams.

27339 (CONF-801055—, pp 138-140) **Once-through heat supply system for city of Bellingham.** Oliker, I. (Burns and Roe, Inc., Oradell, NJ). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

A development of the open district, heating concept is the once-through heat transport system. Technical aspects of the once-through system are discussed as applied to the Bellingham district heating project. The work on this project started in August 1980 and technical and economic analyses are in progress.

27340 **(CONF-810822—1) Planning for energy conservation: the community is the key.** Sewell, I.; Croke, K. (Argonne National Lab., IL (USA)). 1981. Contract W-31-109-ENG-38. 7p. NTIS, PC A02/MF A01. Order Number DE81023118.

From Intersociety energy conversion conference; Seattle, WA, USA (17 Aug 1981).

The concept of viewing a community as a related set of energy demands and supplies in an effort to develop more-effective energy-planning procedures in the United States is explored. Integrated Energy Planning Programs in Sweden and Germany are examined, as well as several projects being sponsored in the United States. Impediments to adopting an integrated planning approach are also discussed. Energy efficiency and conservation are attained mainly through the efficient planning and cost-effective delivery of each separate energy form. An alternate view of the community is to conceive of it as a group of inter-related, end-use markets which generate demands for usable energy. This latter concept of usable energy emphasizes not its form as electricity, oil, or natural gas but rather to its quality (temperature) and its location. Energy is found in different forms and quality everywhere in the community. Some of these streams are presently utilized; those that are not are called waste heat. Thus, energy planning under an integrated concept of community is a process of matching function, processes, and facilities, so that a maximum amount of the total energy stream of a community can be utilized in a cost-beneficial manner.

27341 **(DOE/CS/20030—T2) Feasibility study for industrial utilization of waste derived fuel gas. Task I; step 1; subtask B(1) working paper.** Humphreys, G.B. (Kaiser Engineers, Oakland, CA (USA)). 10 Aug 1979. Contract AC03-78CS20030. 80p. NTIS, PC A05/MF A01. Order Number DE81025805.

Quantities, compositions, and reliability of municipal refuse, sewage sludge, and agricultural (dairy) wastes available as feed materials are estimated. The wasteshed investigated includes those portions of Western San Bernardino County, Eastern Los Angeles County, and Northwestern Riverside County. Existing and proposed landfills serving the study area are indicated. Life expectancies of the landfills are estimated. (MCW)

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS

REFER ALSO TO CITATION(S) 27322, 27323, 27324, 27325, 27326

3301 Internal Combustion Engines

REFER ALSO TO CITATION(S) 27348, 27351, 27352

27342 **Dual-fuel system for diesel engines.** Smith, J.L.; Miller, G.L. (Colorado State Univ., Fort Collins). pp 13p, Paper 14 of Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

The diesel engine dual-fuel concept involves combustion of fuels in a stratified condition. One fuel is used to initiate ignition and ignites the second fuel. The use of a dual-fuel system for introducing ethanol into a diesel engine is being tested since ethanol/diesel fuels tend to separate. The functional components of the Colorado State University's (CSU) dual-fuel system are described in this article. A 2800 series Allis Chalmers diesel engine was used for evaluating the dual-fuel system and comparing that efficiency with operation using 100% of diesel fuel. Pneumatic atomizing nozzles were used to introduce the alcohol into the engine. Better air utilization occured because air in remote parts of the combustion chamber is in contact with atomized alcohol particles. Engines operated on 40 to 50% ethanol/diesel ranging in quality from 160 to 200 proof, with increased energy efficiency. Two hundred proof ethanol produced the greatest increase in efficiency.

27343 **White Engines' stratified charge engine program.** Kandel, G.W. (White Engines, Inc., Canton, OH). pp 11p, Paper 17 of Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

A discussion on the development and characteristics of the direct injected stratified charge combustion system is presented. The history of White Engines' involvement in the fabrication and development is reviewed. This engine is capable of operating on all currently available liquid transportation fuels as well as those which fall short of meeting the octane or cetane requirements necessary for current gasoline of diesel engines. It has a light-weight compact design, low exhaust emissions, excellent cold starting characteristics, and can be turbocharged. If adopted nationwide, it would reduce crude oil consumption at least 20%.

3302 External Combustion Engines

REFER ALSO TO CITATION(S) 27348

3303 Electric-powered Systems

REFER ALSO TO CITATION(S) 27215, 27321

27344 **(DOE/CS/51180—T2) Projected characteristics of light electric trucks.** Hamilton, W.F.; Curtis, R.L. (General Research Corp., Santa Barbara, CA (USA)). May 1979. Contract AC03-76CS51180. 41p. NTIS, PC A03/MF A01. Order Number DE81025812.

Performance and cost are projected for compact-size electric pickup trucks, suburban or panel trucks, and vans. By means of a computerized model, the curb weight, range between recharges, use of electric energy, initial costs, and life-cycle costs are projected for battery fractions ranging from 20 to 40 percent of curb weight. Improved and advanced levels of vehicular technology are considered with future lead-acid, nickel-zinc, or lithium-sulfur batteries, leading to representative designs with ranges of 160, 240, and 360 kilometers, respectively. The corresponding curb weights, energy requirements, and life-cycle costs for a given range are very sensitive to the average operating payload, rising about 50 percent as operating payload increases from a nominal test load of 136 kilograms to 1180 kilograms, the maximum considered for the compact trucks.

27345 **(DOE/CS/51180—T3) Energy use of electric vehicles.** Hamilton, W. (General Research Corp., Santa Barbara, CA (USA)). Sep 1979. Contract AC03-76CS 51180. 20p. NTIS, PC A02/MF A01. Order Number DE81025813.

The overall energy efficiency of future electric vehicles would at best be competitive with that of future conventional vehicles, if petroleum were to be the basic source of both gasoline and electricity. If both gasoline and electricity were to be produced solely from coal, however, about 40% less would be used for electric vehicles because of the relatively low efficiency with which synthetic gasoline can be produced from coal. Projections of fuel use by US electric utilities indicate that even for total electrification of light-duty vehicles, less than 25% of recharge power would be generated from oil in the 1990's. In many areas of the country, little or no petroleum would be used to generate recharge power. Thus the potential for petroleum conservation through vehicular electrification is immense.

27346 **(DOE/CS/51213—T7) Near-term electric vehicle program. Phase II. Power system performance review.** (Garrett Corp., Los Angeles, CA (USA). Airesearch Mfg. Div.). 21 Feb 1979. Contract AC03-76CS51213. 82p. NTIS, PC A05/MF A01. Order Number DE81024301.

Progress in developing a near-term electric vehicle is reported. The power system test program was completed with the performance, noise level, electrical and mechanical losses, and control system characteristics determined by dynamometer tests. The structural and economic feasiblity of using plastics for the vehicle body was demonstrated. Development of high energy density, long-life batteries is continuing. (LCL)

3304 Hybrid Systems

REFER ALSO TO CITATION(S) 27282

3305 Flywheel Propulsion

27347 **(UCRL—15363) Flywheels: mobile applications.** Rabenhorst, D.W. (Lawrence Livermore National Lab., CA (USA); Johns Hopkins Univ., Laurel, MD (USA). Applied Physics Lab.). 17 Jun 1981. Contract W-7405-ENG-48. 18p. NTIS, PC A02/MF A01. Order Number DE81026567.

The characteristics of modern flywheel energy storage systems uniquely qualify the flywheel for use in a variety of road vehicles, off-road vehicles and rail vehicles. About sixty studies and vehicle demonstration programs in a dozen countries indicate that future such flywheel-powered vehicles will have improved performance, reduced energy and fuel consumption and reduced life cycle cost. Flywheel capabilities and mobile applications are reviewed.

3308 Alternative Fuels

REFER ALSO TO CITATION(S) 27007, 27009, 27342, 27343, 27345

27348 **(DOE/NASA/51040—24) Compatibility of alternative fuels with advanced automotive gas-turbine and Stirling engines. A literature survey.** Cairelli, J.; Horvath, D. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). May 1981. Contract AI01-77CS51040. 46p. (NASA-TM—81754). NTIS, PC A03/MF A01. Order Number DE81026671.

The application of alternative fuels in advanced automotive gas turbine and Stirling engines is discussed on the basis of a literature survey. These alternative engines are briefly described, and the aspects that will influence fuel selection are identified. Fuel properties and combustion properties are discussed, with consideration given to advanced materials and components. Alternative fuels from petroleum, coal, oil shale, alcohol, and hydrogen are discussed, and some background is given about the origin and production of these fuels. Fuel requirements for automotive gas turbine and Stirling engines are developed, and the need for certain research efforts is discussed. Future research efforts planned at Lewis are described. 52 references.

27349 **[Marketing of gasohol].** Payne, C. (Diamond Shamrock Corp., Amarillo, TX). pp 9p, Paper 11 of Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

The Diamond Shamrock Corporation's experiences with the marketing of gasohol in Texas, Colorado, and Arkansas are discussed. The shipping of gasohol by pipelines is being tested. A typical gasohol distribution system is described. Testing procedures for quality control are presented. Methods for promoting sales in new areas are also described. (DMC)

27350 **How and why of Norco Alcohol Distributing Co.** Bridge, T.M. (Norco Alcohol Distributing Co., Norfolk, NE). pp 5p, Paper 12 of Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

This article describes how the Norco Alcohol Distributing Company came into being. The company's experience with marketing ethanol for gasohol use is discussed. (DMC)

27351 **[Road tests using straight ethanol fuel].** Scheller, W.A. (Scheller and Associates, Inc., Lincoln, NE). pp 8p, Paper 13 of Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

The results of converting 2 patrol cars in Nebraska to operate on straight alcohol fuel are presented in this article. The test demonstrated the ability of cars driven under severe conditions to perform well when run on ethanol. The state patrolmen do the kind of driving in which they may go from a dead stop to one hundred miles an hour or more. Another type of usual service is normal highway cruising at fifty-five miles an hour. The cars are not used in any appreciable amount of city driving. With only two cars the differences in fuel economy reported cannot be analyzed statistically. Results are reasonably what are expected. The troopers' main comment with regard to using the alcohol powered cars is that only one alcohol fuel supply is available to them (on Superior Street in Lincoln) and thus their driving range is limited. The fuel economy is as expected based on the heat of combustion of gasoline compared to that of two hundred proof ethanol. The cars are getting about the same number of miles per million Btu's for ethanol and gasoline so that the energy efficiency of the ethanol is equivalent to the energy efficiency of gasoline. Another observation is that a cold weather starting system is needed for an alcohol powered car. The system of preheating with propane appears to be adequate. From the safety standpoint the amount of propane being carried in the engine compartment is small enough that it is not a hazard in the event of a front end accident. On February 26, both vehicles began operation using 190 proof ethanol that is produced in Nebraska. We are continuing to follow the vehicle performance and as yet do not have enough data to make any comparisons.

27352 **[Diesel engine modifications for using ethanol fuels].** Ewing, J. (Cummins Rio Grande, El Paso, TX). pp 8p, Paper 15 of Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

Fuel costs and efficiency of industrial engines fueled with diesel, natural gas, alcohol, and gasoline are compared. Two industrial engines were developed for the nation of Brazil having the following requirements: 200 horsepower; 1800 rpm; heat exchanger cooled systems; water-cooled exhaust; and ethanol fueled. The development of these engines is described. The engines are being used to power a boat on the Amazon River. This is the first commercial vessel in the world to be powered by alcohol. The vessel is described. Future plans for the development of a 300 horsepower alcohol fueled engine with a turbocharger are discussed. (DMC)

27353 **Status of gasohol evaluation and its procurement within DOD.** LePera, M. (Army Mobility Equipment Research and Development Command, Ft. Belvoir, VA). pp 35p, Paper 16 of Grain alcohol production and utilization conference. Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).

From 2. annual grain alcohol production and utilization conference; Lincoln, NB, USA (12 Mar 1981).

The Army's Gasohol Evaluation Program is described. It involves 3 phases: a laboratory characterization and compatibility phase; an engine durability phase; and a controlled tactical vehicle fleet test phase. Preliminary findings are summarized. Gasohol implementation for DOD will not take place across-the-board until the Army program has been completed. Gasohol will be used in ad-

ministrative vehicles when available. Results and facts will be disseminated through the Army Gasohol Newsletter.

36 MATERIALS

REFER ALSO TO CITATION(S) 27546

3601 Metals And Alloys

REFER ALSO TO CITATION(S) 26734, 26735, 26736, 26746, 26759, 26760, 26760, 26762, 26763, 26811, 26967, 27105, 27334, 27506, 27624, 27948

27354 (CONF-801055—, pp 102-103) **Corrosion behavior of alloys.** Osteryoung, R.A.; Fernandez, H. Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

The objectives of this work involve studies in molten nitrates at temperatures in the 450 to 550°C range to obtain information which will ultimately permit an understanding of the corrosion behavior of structural alloys, such as Incoloy 800, that will be employed in thermal loops in solar power systems. This work has just gotten underway; initial activity will involve studies of species expected to exist in these melts from corrosion of structural alloys, i.e., iron, nickel and chromium.

27355 **(CONF-8007105—1) Comparison of the electron momentum distribution of solid and liquid Ni as measured by positrons.** Fluss, M.J.; Smedskjaer, L.C.; Chason, M.K. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 6p. NTIS, PC A02/MF A01. Order Number DE81023537.

From 4. LAM conference; Grenoble, France (7 Jul 1980).

This paper compares the measured electron momentum densities seen by positrons annihilating in the defect-free Ni lattice, in vacancies and in liquid Ni. The experimental techniques and analysis method are also described.

27356 **(DOE/ER/03166—T2) Hydrogen and deuterium trapping in iron.** Johnson, H.H.; Lin, R.W. (Cornell Univ., Ithaca, NY (USA). Dept. of Materials Science and Engineering). Feb 1981. Contract AS02-76ER03166. 25p. (CONF-800850—6; COO—3166-33). NTIS, PC A02/MF A01.

From International conference on effects of hydrogen on materials; Jackson Lake Lodge, WY, USA (26 Aug 1980).

The research described is directed at present almost exclusively to hydrogen transport, including both chemical and physical trapping, in iron and iron-base alloys. Some attention is directed to isotope effects. Efforts are made to clarify and understand hydrogen-related phenomena which are believed to be of direct importance to practical performance.

27357 **(DOE/ER/10556—85) Combined macroscopic and microscopic approach to the fracture of metals. Annual progress report, 1980-1981.** Asaro, R.J.; Gurland, J.; Needleman, A.; Rice, J.R. (Brown Univ., Providence, RI (USA). Div. of Engineering). Jun 1981. Contract AC02-80ER10556. 60p. NTIS, PC A04/MF A01. Order Number DE81025544.

Recent progress was achieved in refining and generalizing the methods previously developed for treating the stable crack growth problem, with particular attention to the approximate asymptotic solution of Rice, Drugan and Sham for stress and deformation fields near the tip of a growing crack. The microstructural aspects of ductile fracture were studied in dual-phase steels and high-strength 4340 steels. Very interesting results were obtained in the work on hydrogen effects in steels. In medium strength steels, the ductility-reducing effect of hydrogen is tentatively attributed to the accumulation of hydrogen at internal interfaces with a resulting loss in the resistance to interfacial separation. Extension of Needleman and Rice's work on the growth of cavities at elevated temperatures to the investigation of the effects of triaxial stressing relates the rate of void growth by grain boundary diffusion and dislocation creep to the triaxiality. It provides a good model to analyze the growth of macro-cracks in polycrystals by the mechanisms of growth and coalescence of micro-voids.

27358 **(LA-UR—81-1811) Theoretical model of liquid metals.** Kerley, G.I. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 22p. (CONF-810683—4). NTIS, PC A02/MF A01. Order Number DE81025308.

From International joint conference on thermophysical properties; Gaithersburg, MD, USA (15 Jun 1981).

A theory for calculating the bulk properties of metals and other materials is described. The approach is based upon the fluid perturbation theory of Kerley and the electronic structure model of Liberman. Application of the theory involves three steps. First, the zero Kelvin isotherm of the solid is constructed from electronic structure calculations, experimental data, or both. This curve contains information about the effective interactions between atoms in the ground electronic state. Next, the cold curve is combined with perturbation theory to compute contributions from thermal motion of the atoms to the liquid properties. Finally, contributions from thermal electron excitation are computed using the electronic structure model. This paper shows that theory agrees well with experimental data for xenon and iron.

27359 **(LA-UR—81-1816) Nuclear explosive driven experiments.** Ragan, C.E. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 6p. (CONF-810684—27). NTIS, PC A02/MF A01. Order Number DE81025311.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

Ultrahigh pressures are generated in the vicinity of a nuclear explosion. We have developed diagnostic techniques to obtain precise high pressures equation-of-state data in this exotic but hostile environment.

27360 **(LA-UR—81-1824) Shock-compression measurements at pressures >1 TPa.** Ragan, C.E.; Diven, B.C.; Rich, M.; Robinson, E.E.; Teasdale, W.A. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 6p. (CONF-810684—21). NTIS, PC A02/MF A01. Order Number DE81025313.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

A nuclear explosive generated planar shock has been used to perform impedance-matching experiments relative to a molybdenum standard. Shock velocities were measured with accuracies of 1.5% to 2.5%, thus providing Hugoniot data for samples of Al, quartz, Fe, Mo, and low-density Mo at pressures from 2 to 5 TPa.

27361 **(LA-UR—81-1889) Molecular dynamics study of sodium using a model pseudopotential.** Swanson, R.E.; Straub, G.K.; Holian, B.L. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 5p. (CONF-810684—31). NTIS, PC A02/MF A01. Order Number DE81025341.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

The dynamics of sodium is investigated using the coulomb and Born-Mayer interaction augmented by a model pseudopotential to represent the electron interactions including screening, exchange, and correlation. The model parameters were previously determined and have been shown to accurately reproduce experimental equation-of-state, lattice vibration, and crystal phase properties of sodium in the harmonic limit. In this paper the equation-of-state and structural properties are examined in molecular dynamics calculations. The long range effects of the potential are included. Typically, each particle interacts with about 500 neighbors. The calculated equation of state of sodium in the hcp, bcc, and liquid structures is discussed.

27362 **Molecular dynamics study of interstitial-solute interactions in irradiated alloys. 1. Configuration, binding and induced migration of mixed dumbbells in Al-Zn alloys.** Lam, N.Q. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Section de Recherches de Metallurgie Physique; Oak Ridge National Lab., TN (USA)); Doan, N.V.; Adda, Y. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Section de Recherches de Metallurgie Physique). *Journal of Physics F: Metal Physics ;* **10**: No. 11, 2359-2373(Nov 1980).

The molecular dynamics technique has been used, in conjunction with the interionic potentials of Dagens et al, to study the stability, configuration, binding, and induced migration of mixed dumbbells in an irradiated Al-Zn alloy. For the purpose of comparisons, self-interstitials in pure Al were also investigated. The Al-Al and Al-Zn interactions were described by pair potentials which extended to ninth-neighbour distances. Both the self-interstitial dumbbell and the mixed dumbbell were found to be stable in the <100> configuration. The formation energy of the self-interstitial is 2.89 eV and the mixed-dumbbell binding energy is 0.38 eV. As a result of this strong binding, the threshold energy required to induce the migration of the mixed dumbbell is about 1.2 eV, which is significantly larger than the minimum energy of about 0.15 eV transferred to a self-interstitial to induce its jumps in pure Al. Caging motions of the mixed dumbbell were observed. The present computer-simulation results are compared with experimental measurements.

27363 (ORNL/FMP—81/2, pp 9-23) **Coal Liquefaction Alloy Test Program.** Levy, A. (Lawrence Berkeley Lab., CA). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

The objective of the program is to determine the erosion/corrosion behavior of materials used in the flow passages of liquid slurries under conditions representative of those in coal liquefaction systems. From the understanding gained from testing a number of different materials over a range of controlled operating conditions within and beyond those of currently acceptable operating practice, slurry flow operating parameter guidelines and improved performance materials selection and design criteria will be developed. The program is structured to investigate the major variables inherent in the design and operation of non-aqueous liquid-solid particle slurry systems. These are: (1) flow passage geometry; (2) materials of construction; (3) slurry composition and properties; and (4) operating conditions.

27364 (ORNL/FMP—81/2, pp 41-61) **Design of low alloy steels for thick walled pressure vessels.** Todd, J.A.; Parker, E.R. (Univ. of California, Berkeley). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

The objective of this program is to modify existing commercial low-alloy steels or to develop new alloys which can be field-fabricated into large diameter, thick walled pressure vessels for coal gasification and liquefaction systems. Emphasis will be placed on evaluating the effects of minor additions of Ni and Mn to 2.25 Cr-1 Mo steel, and Cr, Mn, Si to Mn-Mo-Ni steel. Five areas of study have been defined: (1) hydrogen attack; (2) temper embrittlement; (3) fracture mechanics testing; (4) weldability; and (5) elevated temperature properties. The hydrogen attack study will investigate the metallurgical variables which control the attack susceptibility of low-alloy pressure vessel steels. The influence of microstructure, carbide stability, carbide morphology and alloying elements will be studied in detail. Comparisons will be made between commercial 2.25 Cr-1 Mo steel, SA533B and their alloy modifications, particularly those containing additional Cr which the Nelson curves predict to have improved hydrogen attack resistance.

27365 (ORNL/FMP—81/2, pp 63-66) **Investigation of the transformational characteristics and cold-cracking sensitivity of modified 9 Cr-1 Mo steel.** Sikka, V.K.; Lundin, C.D. (Oak Ridge National Lab., TN). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

The primary objective of the 9 Cr-1 Mo weldability program is to document the cold cracking behavior and transformational characteristics of the modified 9 Cr-1 Mo alloy. Further efforts are included to contrast the behavior of modified 9 Cr-1 Mo with standard 9 Cr-1 Mo, HT9 (12 Cr-1 Mo-V-0.2 C), and 2-1/4 Cr-1 Mo alloys. Four heats of modified 9 Cr-1 Mo and one heat each of standard 9 Cr-1 Mo, HT9, and 2-1/4 Cr-1 Mo will be tested. The testing will include dilatometric and electrical resistivity measurements and will be used to determine the transformation behavior of 9 Cr-1 Mo for on-heating and on-cooling conditions. A Battelle test and hydrogen sensitivity tests will be conducted for cracking sensitivity, and the evaluation of practical preheat temperature-hold conditions will be determined.

27366 (ORNL/FMP—81/2, pp 67-93) **Characterizing and improving the toughness of thick-sectioned 2-1/4 Cr-1 Mo electroslag weldments.** Edwards, G.R.; Frost, R.H. (Colorado School of Mines, Golden). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

The electroslag welding process produces large single pass welds by consuming a wire electrode in an ohmically heated flux pool. The process has been particularly appealing for thick-section welding because of its high deposition rate. Application of electroslag welding is currently hindered, however, by the lack of fundamental understanding of critical process variables, thermal history, and heat treatment of the heat affected zone, and the influence of flux and alloy chemistry on the structure and properties of the weld fusion zone. Careful control of process variables and process chemistry is critical to fabrication. The objective of this program is to characterize the effects of process variables, chemical variables, and post weld heat treatment, and to apply straight-forward metallurgical knowledge in optimizing the properties of 4-inch thick 2-1/4 Cr-1 Mo steel electroslag weldments.

27367 (ORNL/FMP—81/2, pp 95-97) **Welding support and development.** Edmonds, D.P.; Goodwin, G.M. (Oak Ridge National Lab., TN). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

The purpose of this task is to investigate and develop economical techniques for welding and cladding critical components, to help evaluate and characterize heavy-section weldments, and to provide general consultation for welding of coal conversion systems.

27368 (ORNL/FMP—81/2, pp 99-100) **X-ray study of residual stresses in narrow groove TIG weldments.** Ruud, C.O. (Pennsylvania State Univ., University Park). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

This study is to compare the residual stress field resulting from certain other types of welds to that of narrow gap hot wire gas tungsten arc (GTA) welds. It has been proposed that narrow gap (groove) welding could lead to the reduction of stress relief treatment in heavy 2.25 Cr-1 Mo steel sections. Furthermore, the low distortion resulting from the GTA process alone is indicated of lower residual stress inducement. As an integral part of this project, procedures for measuring three dimensional residual stress contours in low alloy steel plate will be developed for application of a new type of x-ray stress analyzer developed by the principal investigator. Both x-ray and stress relief techniques will be applied to provide three dimensional stress contours in the 2.25 Cr-1 Mo steel weldments.

27369 (ORNL/FMP—81/2, pp 101-106) **Development of automated welding process for field fabrication of thick walled pressure vessels.** Schneider, U.A. (Westinghouse Electric Corp., Tampa, FL). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

This research program is comprised of 4 separate tasks. The first task which is a review of currently available welding processes

and project planning is completed. The second task is the adaptation of the GTAW-HW narrow groove process to the vertical and horizontal welds of the program's materials. The process parameters developed in this program will also provide qualification data. In task 3, 8" thick field demonstration/qualification welds will be performed in the vertical and horizontal positions. The fourth task is the compilation of material for a welding procedure handbook. (DMC)

27370 (ORNL/FMP—81/2, pp 107-114) **Alloy evaluation for fossil fuel process plants (liquefaction).** Woods, C.M.; Scott, T.E. (Ames Lab., IA). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

The objective of this program is to evaluate the mechanical properties of liquefaction process plant dissolver vessel materials in a dissolver vessel environment including coal slurry and pressurized hydrogen gas at temperatures up to 800°F. Originally, the intent was to test at 900°F but it was soon learned that above 850°F (455°F) gasification is ignited giving coke and methane. Specifically, the degradation of notched-bar and smooth-bar tensile samples of 2-1/4 Cr-1 Mo will be monitored as a function of exposure time and stress in the dissolver vessel environment. Compact tension specimens will be used to monitor the degradation of fracture properties in the dissolver vessel environment. Notched-bar tensile specimens will be used to evaluate the behavior of 2-1/4 Cr-1 Mo steel in pure hydrogen gas at various temperatures and pressures. The objective is to determine the Nelson curve.

27371 (ORNL/FMP—81/2, pp 115-133) **Hydrogen attack in Cr-Mo steels at elevated temperatures.** Stone, D.; Su, Z.; Wanagel, J.; Li, C.Y. (Cornell Univ., Ithaca, NY). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

Cr-Mo steels have been identified as potential structural materials for coal conversion plants. This project is designed to obtain microstructure and mechanical property data of these steels under the simultaneous influence of high temperature and high pressure hydrogen and an applied stress. In particular the work will include an experimental determination of the kinetics of nucleation and growth of gas bubbles or cavities in 2-1/4 Cr-1 Mo steels at elevated temperatures under the influence of high pressure hydrogen and applied stress, and the development of kinetic equations for estimating the number density and size distribution of grain boundary bubbles or cavities as a function of time under conditions of interest to coal conversion plant operations.

27372 (ORNL/FMP—81/2, pp 135-150) **Evaluation of fracture toughness of pressure vessel steels.** Stelzman, W.J.; Danonico, D.A.; Swindeman, R.W. (Oak Ridge National Lab., TN). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

This task is concerned with the influence of an operating environment on the in-service reliability and safety of large pressure vessels for use in second-generation coal conversion systems. The candidate steels from which these vessels will be constructed can be embrittled by exposure at the currently projected operating conditions of these units. Of prime concern is the effect of the coal conversion environment, in particular hydrogen, on both low- and high-temperature properties of these steels. Several steels are candidates for the construction of large, second-generation commercial pressure vessels, including SA-516 grade 70, SA-204 grade B, SA-387 grade 22, class 2, SA-533 grade B, class 1, and A-543. The composition and strength requirements for these grades are given. Mechanical properties data, including fracture toughness, are being obtained in this task.

27373 (ORNL/FMP—81/2, pp 151-172) **Analysis of hydrogen attack on pressure vessel steels.** Vagarali, S.S.; Odette, G.R. (Univ. of California, Santa Barbara). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

Steels used for fabrication of coal conversion vessels are exposed to hydrogen at high temperatures and pressure (T = 450°C and P/sub H_2/ = 15 MPa). Under these conditions hydrogen readily diffuses into the metal matrix and may react with carbon at internal surfaces to form methane. This phenomenon, known as hydrogen attack (HA), may result in internal decarburization and the nucleation, growth and eventual coalescence of grain boundary cavities. These microstructural changes, in turn, result in severe degradation of mechanical properties. Hence, HA may be a serious failure mechanism for thick-walled pressure vessels. The purpose of this research is to develop physical models of the HA process describing important mechanisms and containing pertinent environmental and metallurgical parameters. These models are then used to statistically correlate engineering and laboratory data and to extrapolate the data to predict HA behavior under actual vessel service conditions.

27374 (ORNL/FMP—81/2, pp 173-187) **Study to optimize Cr-Mo steels to resist hydrogen and temper embrittlement.** Shaw, B.J. (Westinghouse Electric Corp., Pittsburgh, PA). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

The primary objective of this program is to evaluate a range of Cr-Mo steels in order to assess the role of compositional variables on the susceptibility to hydrogen and temper embrittlement. The program is divided into two phases. Phase I is designed to establish the hydrogen embrittlement susceptibility of commercial 2-1/4 Cr-1 Mo steels provided by the American Petroleum Industry. This phase consists of two parts. The first part is to assess the hydrogen embrittlement characteristics of the steels at conventional strength levels. Phase II consists of an evaluation of 32 laboratory heats with compositions arranged according to a statistical design and tempered in a bainitic condition to two strength levels, corresponding to the ranges used in Phase I. In order to obtain a screening test for the low strength steels, it was decided to introduce a more potent environment. The results of tests on both high and low strength steels subjected to the same (mechanical) test procedure using hydrogen sulfide gas saturated with water vapor for the environment appeared to be quite satisfactory in that steels over the entire strength level range were embrittled. This report gives the initial experimental results from eight compact tension specimens tested in the $H_2S + H_2O$ vapor environment.

27375 (ORNL/FMP—81/2, pp 189-204) **Corrosion in coal liquefaction processes.** Prager, M. (Metal Properties Council, Inc., New York, NY); Lyle, F.F. Jr.; Arey, R.W.; Adams, L.M. Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

A two-year research program to study the corrosivity of various coal liquefaction process fluids is being conducted at Southwest Research Institute (SwRI) under the technical direction of The Metal Properties Council, Inc. (MPC). The program includes two major tasks: (1) corrosion tests utilizing representative coal liquids obtained from liquefaction pilot plants; and (2) quantitative chemical analyses of the coal liquids used in the corrosion tests. The objectives of this program are to: determine the general susceptibility of carbon steels, stainless steels, and nickel-base alloys to corrosion in coal liquids; identify and measure concentrations of suspected corrosive species in coal liquids before and after corrosion tests; determine the effects of temperature on the corrosion of metals and on the stability of corrosive species in coal liquids; relate extent, type of corrosion, and corrosion mechanism(s) to corrosive species present in coal liquids; and provide background data for the interpretation of results of in-situ corrosion tests and failures in liquefaction plants. As these objectives indicate, the major thrust of the program is directed toward determining the chemical species present in coal liquids which are responsible for corrosion, rather than toward the generation of corrosion-rate data suitable for use in plant design.

27376 (ORNL/FMP—81/2, pp 205-210) **Liquefaction corrosion.** Judkins, R.R. (Oak Ridge National Lab., TN). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

This research program consists of 2 tasks: determining the resistance of various materials to stress-corrosion cracking in coal liquefaction plants; and determining the potential for general corrosion in coal liquefaction plants. Corrosion rates of U-bend specimens exposed at the Exxon Coal Liquefaction Pilot Plant, Wilsonville dissolver, and the Wilsonville high pressure separator are tabulated. (DMC)

27377 (ORNL/FMP—81/2, pp 211-212) **Failure prevention and analysis in coal liquefaction systems.** Swindeman, R.W.; Keiser, J.R.; Baylor, V.B. (Oak Ridge National Lab., TN). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

Activities under this task are aimed at improving materials performance in coal liquefaction plants through careful metallurgical examination of components that have been exposed to actual process conditions. A working relationship with liquefaction plant personnel has been established, and procedures have been developed for both on-site and laboratory examination of these materials.

27378 (ORNL/FMP—81/2, pp 215-220) **Wear-resistant materials for coal conversion and utilization.** Kelley, J.E. (Dept. of the Interior, Albany, OR). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

This program is to evaluate the erosion- abrasion- and galling-resistance of valve materials and materials processing methods for improved wear in coal conversion and utilization components. The research is organized into four tasks: erosion testing of potential valve materials at several particle velocities and impingement angles, support to Morgantown Energy Technology Center (METC) valve development program, liaison and consultation to DOE contractors on materials for wear resistance, and testing of laser-processed valve seats in coal ash.

27379 (ORNL/FMP—81/2, pp 299-306) **Effect of coal gasification atmospheres on biaxial creep of alloys.** Horton, R.M. (EG and G Idaho, Inc., Idaho Falls). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

Several processes have been proposed for production of high-Btu coal gas, but none has been developed commercially. Concern exists regarding the integrity of possible construction materials under the relatively severe process conditions anticipated. Exposure of candidate materials, in both laboratory-simulated environments and pilot plants, has been used to evaluate such effects as corrosion, erosion-corrosion, and the possible effects of coal gasification atmospheres (CGAs) upon selected mechanical properties. Many potential applications of these candidate alloys involve biaxial loading. A DOE-sponsored test program was initiated to measure the biaxial stress rupture strength, life, and ductility of four candidate gasifier internal alloys under simulated CGA conditions. The data from the tests would be used to confirm any trends observed in the uniaxial stress rupture tests, demonstrate the differences caused by biaxial loading, and produce an empirical correlation between uniaxial and biaxial rupture strengths. Fatigue testing of these four alloys in CGA and embrittlement testing of candidate pressure vessel alloys in CGA is planned for the future.

27380 (ORNL/FMP—81/2, pp 307-308) **Corrosion and mechanical behavior of materials for application in coal conversion and utilization.** Natesan, K. (Argonne National Lab., IL). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

The purpose of this program is to: (1) experimentally evaluate high-temperature corrosion of iron- and nickel-base alloys over a range of oxygen, carbon, and sulfur potentials; (2) evaluate deposit-induced hot-corrosion behavior of heat-exchanger and gas turbine materials after exposure to simulated coal-gasification environments; (3) develop uniaxial tensile data on Type 310 stainless steel, Inconel 371, Incoloy 800, and US Steel alloy 18-8-2; and (4) develop techniques for evaluating corrosion problems in coal combustion systems. The information produced in this program is used to provide a rational basis for extrapolation of corrosion rates as a function of temperature, pressure, alloy composition, and environmental conditions.

27381 (ORNL/FMP—81/2, pp 309-315) **Corrosion of alloys for tar sands systems and in situ gasification.** Loop, R.B. (EG and G Idaho, Inc., Idaho Falls). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

This program is divided into 2 tasks - in-situ coal gasification and in-situ tar sand studies. Several potential materials problems are associated with in situ coal gasification. These include materials used for downhole piping (injection and production wells), instrumentation wells, and production lines and associated valves and elbows. The first task was designed to expose a series of specimens to production line conditions at available in situ coal gasification test sites involving various coal types and production conditions (including both oxygen/steam and air injection) as the means of supporting coal seam combustion. Most specimens were selected from those materials undergoing evaluation for use in aboveground gasifiers in a program directed by the Metals Properties Council. The specimens were exposed at various angles to the product gas stream, to allow a determination of whether any observed material degradation occurred as a result of corrosion, erosion, or a combination of erosion/corrosion under a variety of conditions. Tar sands deposits within the continental United States provide another potential domestic energy source. Most of these deposits exist in a form which requires in situ techniques to recover the entrapped tar or bitumen. The second task of the program was developed to expose specimens to product streams at available in situ tar sands test sites. Specimens were selected from a range of materials representative of those currently used in, or potential candidates for, similar oil field operations. Specimen configurations were selected to assess the susceptibility of the candidate materials to various corrosion mechanisms.

27382 (ORNL/FMP—81/2, pp 317-330) **Corrosion of metals and refractories in coal gasification plants.** Schaefer, A.O. (Metal Properties Council, Inc., New York, NY); Howes, M.A.H.; Barton, K.J.; Firestone, R.; Yurkewycz, R. Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

This study, Phase II of a four-part program, consists of coupon corrosion monitoring in operating pilot plant gasifiers. The data, together with those from the laboratory tests, permits increased confidence in materials selection and corrosion rate prediction for coal gasification plants. The program includes metals and refractories: metals have been exposed in both high-temperature gasifier locations and in lower temperature aqueous locations; refractories have only been exposed in the gasifier vessels.

27383 (ORNL/FMP—81/2, pp 331-347) **Erosion/corrosion of materials in coal gasification atmospheres.** Schaefer, A.O. (Metal Properties Council, Inc., New York, NY); Howes, M.A.H.; Barton, K.J.; Vesely, E.J. Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

The objective of the Phase IV testing program is to provide baseline data on the erosion-corrosion resistance of materials potentially useful for the construction of gasifier internals. The results provide information additional to that from the Phase I high-temperature gas corrosion program as a basis for materials selection decisions. Two high-temperature test reactors have been constructed for the Phase IV erosion-corrosion testing program, one operating at atmospheric pressure and the other at pressures up to 1000 psi. Both reactors utilize as a test environment the simulated coal gasification atmosphere approved by MPC. In the 1981 test program, alloys will be evaluated under several combinations of test conditions encompassing temperatures of 1650° and 1800°F, erodent velocities of 50 and 100 fps, operating pressures of atmospheric, 500 and 1000 psi, erodents of low, medium, and high sulfur chars and inert Al_2O_3, and time of 50 to 250 hr. A primary objective of the 1981 program is to provide information on the interrelation of metal loss, exposure time, and erodent velocity.

27384 (ORNL/FMP—81/2, pp 371-373) **Heat exchanger and internal structural materials for AFBC.** DeVan, J.H.; Ficalora, P.J. (Oak Ridge National Lab., TN). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

The objective of this research has been to study the oxidation-sulfidation of atmospheric fluidized-bed combustor (AFBC) heat exchanger materials. A consistent observation derived from in-bed surveillance examinations has been the presence of well-developed, contiguous $CaSO_4$ coatings on all heat exchanger and associated hanger surfaces exposed to the fluidized-bed environment. These coatings are potentially important because they may react with the normally protective oxides produced at the metal surface and may lead to increased oxygen and sulfur activities within the oxide compared to the nominal activities in the fluidized bed.

27385 **(RFP-Trans—290) Study of solidification substructures of 99.99% aluminum by epitaxial oxide films and corrosion figures.** Biloni, H.; de Destaillats, L.H. Translated from *Metaux: Corrosion-Industrie ;* No. 404, 137-150(1959). 16p. NTIS, PC A02/MF A01.

The combined use of the techniques of corrosion figures and epitaxial oxide films is very suited to obtaining information on the relationships which exist between the segregation substructures and the distribution of corrosion figures. Corrosion figures in fact are known to result from the presence of impurity-dislocation associations (the impurities are segregated during solidification, and the dislocations are produced by the mechanism proposed by Tiller). The metal used was 99.99% aluminum containing 20 to 50 ppM Mg, 5 ppM Fe, 5 ppM Si and 5 ppM Cu. The study was performed both on crude solidification specimens and on single crystals obtained by Chalmers' method, which uses a horizontal furnace moving relative to a fixed specimen.

27386 (SAND—80-2577/Vol.2, pp 139-162) **Titanium alloy corrosion in subseabed environments.** Braithwaite, J.W.; Magnani, N.J.; Abrego, L. (Sandia Labs., Albuquerque, NM). Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 1 of 2.

A corrosion study has been conducted on the titanium alloys Ti-50A, TiCode-12, and Ti-Pd to evaluate their suitability as a long lifetime (300-600 year) canister material for the isolation of nuclear wastes. TiCode-12, selected as the primary candidate material, is shown to be very resistant to environmental attack. Elecrochemical, general corrosion, and stress corrosion cracking experiments have been conducted. The data from these experiments, including those from severe overtests, have shown that Ti Code-12 is a viable candidate material for long-term waste isolation.

27387 **(UCRL—53074) Pulsed-laser heating: a tool for studying degradation of materials subjected to repeated high-temperature excursions.** Goldberg, A.; Cornell, R.H. (Lawrence Livermore National Lab., CA (USA)). 21 Aug 1980. Contract W-7405-ENG-48. 48p. NTIS, PC A03/MF A01. Order Number DE81026330.

The use of pulsed-laser heating was evaluated as a means to obtain high cyclic peak temperatures with short rise times. A two-stage neodymium glass laser was used which produces a 600-μs pulse with energy outputs of up to 100 J. Small disk-shaped samples of AISI 4340 steel served as targets. Some of these were coated with a tungsten deposit. The rear face of some of the targets was instrumented for evaluation of temperature, strain, and stress response. Post-shot metallographic evaluations were made on a number of targets. We saw evidence of surface melting, cracking, and phase transformation. Surface damage was related to differences in the number of pulse cycles and input energy level, variables in the target materials, and the extent of strain-induced stresses. These experiments were performed in air at 1 atm and ambient laboratory temperature. 36 figures.

27388 **(UCRL—86301) Contrasts in one- and two-dimensional hydrocode calculations of laser-generated shockwaves in disk targets.** Harrach, R.J.; Lee, Y.T.; Trainor, R.J.; Holmes, N.C.; Rosen, M.D.; Banner, D.L.; Olness, R.J. (Lawrence Livermore National Lab., CA (USA)). 22 Jun 1981. Contract W-7405-ENG-48. 9p. (CONF-810684—40). NTIS, PC A02/MF A01. Order Number DE81026026.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

A comparison is made between 1D and 2D hydrocode calculations and some recent experimental results on laser-driven planar shockwaves in disk targets. A simple model is described which accounts for the trends seen in the calculations and which gives insight into the regime of laser intensity and pulse duration where two-dimensional effects become significant in these experiments.

27389 **Calculated electrical and thermal resistivities of Nb and Pd.** Pinski, F.J.; Allen, P.B.; Butler, W.H. (State University of New York at Stony Brook, Stony Brook, New York 11794). *Physical Review* [*Section*] *B: Condensed Matter ;* **23**: No. 10, 5080-5096(15 May 1981).

The electrical and thermal resistivities (rho and W) of pure Nb and Pd are calculated from nearly first principles. Realistic Korringa-Kohn-Rostoker energy bands and wave functions, experimental phonon frequencies and Born—von Karman eigenvectors, and rigid muffin-tin electron-phonon potentials are used to generate the velocities and scattering probabilities in the Bloch-Boltzmann equation, at a mesh of nearly 48 000 points on the Fermi surface. Solutions for rho and W are exhibited at three levels of accuracy: (1) the lowest-order variational approximation (LOVA) where the Fermi surface displaces rigidly; (2) the N-sheet approximation where different sheets of Fermi surface displace independently; (3) a fully inelastic calculation where the N-sheet approximation is used and the distribution function is allowed arbitrary variations with energy (normal to the Fermi surface) to reflect the inelasticity of electron-phonon scattering. Above T = 100 K, corrections to LOVA are of order 1%, but below T = 100 K, both the N-sheet approximation and inelasticity give large corrections to the LOVA results. These results are also compared with Bloch-Grueneisen formulas fitted at T~Θ/sub D/. In the range 100 K< or ≈T< or ≈300 K, calculations exceed experimental results by ~10%. Good agreement persists into the range 10 K< or ≈T< or ≈100 K, except that in Nb theory underestimates experiment significantly at the lower-temperature end, suggesting a possible error of rigid muffin-tin models for small Q scattering. In Pd the interpretation is complicated by Coulomb effects. Below T = 10 K, finite mesh size prevents reliable calculations. Simple models such as Bloch-Grueneisen theory are inadequate to account for the data. Mott's (1936) "s-d" picture is shown to be qualitatively correct for Pd. Extension of this picture to Nb was suggested subsequently by various authors, but the present calculation does not support this.

27390 **Optical properties of liquid mercury.** Inagaki, T.; Arakawa, E.T.; Williams, M.W. (Health and Safety Research Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). Contract W-7405-ENG-26. *Physical Review* [*Section*] *B: Condensed Matter ;* **23**: No. 10, 5246-5262(15 May 1981).

Interest in the optical properties of liquid Hg has resulted in numerous studies over the past quarter of a century. Consistent differences have been observed between the optical properties of liquid Hg deduced from reflectance and from ellipsometric spectra, and several models have been proposed which have attempted to explain these differences by the introduction of an inhomogeneous and/or anisotropic surface region. However, a systematic analysis of the previously existing and new ellipsometric data for liquid Hg fails to demonstrate the existence of a surface transition zone having inhomogeneous and/or anisotropic properties. It is further shown that the contradiction between the optical constants obtained from ellipsometric and from reflectance measurements is not real and that the former are representative of liquid Hg while the latter contain large uncertainties because of insufficient sensitivity. The observed deviations of the optical constants of liquid Hg from "Drude" behavior still require theoretical explanation.

27391 Theory of the specific-heat coefficient of a Hume-Rothery alloy. Faulkner, J.S.; Stocks, G.M. (Metals and Ceramics Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Physical Review [Section] B: Condensed Matter ;* **23**: No. 10, 5628-5631(15 May 1981).

The coefficient of the linear part of the low-temperature specific heat is calculated for alloys of zinc in copper having three different concentrations. The densities of states are obtained from a parameter-free calculation based on the Korringa-Kohn-Rostocker coherent-potential approximation, and the electron-phonon enhancement factors are estimated from resistivity data. The results of the historically important experiments on this system are reproduced in detail.

27392 Elasticity of Mo-Re and W-Re alloys under hydrostatic pressure. Katahara, K.W.; Manghnani, M.H.; Devnani, N. (Hawaii Institute of Geophysics, University of Hawaii, Honolulu, Hawaii 96822). Contract EY-76-S-03-0235. *Journal of Applied Physics ;* **52**: No. 5, 3360-3362(May 1981).

The elastic moduli of single crystals of Mo-16%Re, Mo-29% Re, and W-11% Re have been measured to 0.5 GPa (5 kbar) hydrostatic pressure at room temperature. The composition dependence of the pressure derivatives of the moduli follows the trends established for Nb-Mo and Ta-W alloys. This finding was unexpected since the shear modulus, $C' = (C_{11}-C_{12})/2$ has a sharp peak in its composition dependence at e/a = 6.0. The results are explained in terms of the differing effects of compression on different d-electron subbands. Because dC'/dP decreases with increasing Re content, it is also suggested that the compositional range for stability of the bcc structure decreases with increasing pressure.

27393 Shock compression of aluminum, copper, and tantalum. Mitchell, A.C.; Nellis, W.J. (Lawrence Livermore National Laboratory, Livermore, California 94550). *Journal of Applied Physics ;* **52**: No. 5, 3363-3374(May 1981).

Hugoniot curves for Al (alloy 1100), Cu (type oxygen-free high-conductivity), and Ta have been measured in the shock pressure range 30—430 GPa (0.3—4.3 Mbar) with a two-stage light-gas gun. Impactor velocities were measured to 0.1% by flash radiography. Shock velocities were measured to 0.5—1.2% with an electronic detection system with subnanosecond time resolution. Our data and those of other workers were fitted to a linear relation between shock and mass velocities. The fractional standard deviations of the data from the fits range from 0.6 to 0.9% for the three metals. Methods of data analysis and error analysis for individual data points and for the least-squares fitting to the data sets are presented. Bands of uncertainty about the fits, arising from experimental uncertainties in the data, are presented and are used to calculate the systematic error introduced by the method of shock-impedance matching. The accuracy of the data and of the fits qualifies these metals as equation-of-state standards for shock-wave experiments.

27394 Work function of sputter-formed Re-1% Pt. Gordon, R.L.; Stoffels, J.J.; Porter, S.K. (Pacific Northwest Laboratory, Richland, Washington 99352). *Journal of Applied Physics ;* **52**: No. 5, 3458-3463(May 1981).

High-rate sputter deposition has been used to make free-standing ribbons of Re-1% Pt alloy. Changes in the work function and surface composition of the alloy as a function of temperature are reported. Segregation of Pt to the surface was accompanied by a decrease in work function indicating electron transfer from Pt to Re. When the Pt-to-Re ratio at the surface reached 0.26, the work function of the alloy was 1.44 eV below that of a pure Re reference ribbon. Analysis of the work function change as a function of surface concentration of Pt on the Topping model yielded values of 7.1×10^{-30} C m and 19.4 A^3 for the dipole moment and polarizability, respectively, of surface Pt atoms. Electron transfer from Pt to Re is opposite to that expected on the basis of published values of electronegativity and is interpreted as indicating significant exchange of 5d electrons in the alloy.

27395 Chemical diffusion in intermediate phases in the lithium-silicon system. Wen, C.J.; Huggins, R.A. (Stanford Univ., CA). Contract EC-77-S-02-4506. *Journal of Solid State Chemistry ;* **37**: No. 3, 271-278(May 1981).

The equilibrium coulometric titration curve shows four intermediate phases in the Li-Si system at 415°C. The nominal compositions for these phases are $Li_{12}Si_7$, Li_7Si_3, $Li_{13}Si_4$, and $Li_{22}Si_5$, respectively. They all have quite narrow ranges of homogeneity. The compositional variations of the chemical diffusion coefficients within the various intermediate phases are similar to each other and closely resemble those of the thermodynamic enhancement factor for each phase. The chemical diffusion coefficients across all four intermediate phase are essentially of the same order, about 6.0 x 10^{-5} cm^2/s at 415°C. 9 figures.

27396 Hydrogen permeation characteristics of some austenitic and nickel-base alloys. Van Deventer, E.H.; Maroni, V.A. (Argonne National Lab., IL (USA). Chemical Engineering Div.). *Journal of Nuclear Materials ;* **92**: No. 1, 103-111(Aug 1980).

The hydrogen permeabilities of 321-SS, 316-SS, Inconel-625, and Inconel-718 have been measured for hydrogen driving pressures in the range from 10^3 to 10^4 Pa and for temperatures between 350 and 1050 K. It was found that the use of active hydrogen purity control measures, which included direct hydrogen supply by a temperature-controlled uranium hydride bed and the implementation of a throttled ion pump, greatly increased the capability to obtain unperturbed permeation data at low driving pressures, i.e., < 10 Pa. For all four alloys studied, a half-power dependence of permeability on hydrogen driving pressure was obtained at the higher end of the pressure range studied. Also, the pressure at which deviations from a half-power dependence occured was found to depend to a great extent on upstream hydrogen purity. In general, the Inconel alloys appeared slightly more sensitive to impurities (such as H_2O and O_2) than the austenitic alloys, quite possibly because of the presence of small amounts of aluminium in the Inconels.

27397 Secondary-ion emission from clean and oxygen-covered beryllium surfaces. Pt. 2. Energy dependence. Krauss, A.R.; Gruen, D.M. (Argonne National Lab., IL (USA). Chemistry Div.). *Surface Science ;* **92**: No. 1-3, 14-28(Feb 1980).

The secondary-ion energy distribution obtained by sputtering clean and oxygen-covered Be has been analyzed in terms of competing processes in secondary ion emission. The ion energy distribution $N^+(E)$ has been separated into an ionization coeffizient $R^+(E)$ and a total energy distribution, N(E), i.e. $N^+(E) = R^+(E)\,N(E)$. Experimentally, the dependence of $R^+(E)$ on both energy and oxygen coverage indicated a linear superposition of adiabatic tunneling and resonance ionization processes from clean and oxygen-covered portions of the surface with no contributions to the secondary-ion yield from regions of intermediate coverage. Total energy distributions of sputtered Be atoms have been deduced and the principal features agree with the predictions of the collision cascade sputtering model. Variations of the energy distributions with oxygen coverage are in accord with small changes expected in the surface binding energy as a result of surface oxidation.

27398 Interaction of cesium and oxygen on W(110). Pt. 1. Cesium adsorption on oxygenated and oxidized W(110). Desplat, J.L.; Papageorgopoulos, C.A. (National Aeronautics and Space Administration, Moffett Field, CA (USA). Ames Joint Inst. for Surface and Microstructural Research; Rasor Associates, Inc., Sunnyvale, CA (USA)). *Surface Science ;* **92**: No. 1-3, 97-118(Feb 1980).

Cesium adsorption on oxygenated and oxidized W(110) is studied by Auger electron spectroscopy, LEED, thermal desorption and work function measurements. For oxygen coverages up to 1.5 x 10^{15} cm^{-2} (oxygenated surface), preadsorbed oxygen lowers the cesiated work function minimum, the lowest (approximately 1 eV) being obtained on a two-dimensional oxide structure with 1.4 x 10^{15} oxygen atoms per cm^2. Thermal desorption spectra of neutral cesium show that the oxygen adlayer increases the cesium desorption energy in the limit of small cesium coverages, by the same amount as it increases the substrate work function. Cesium adsorption destroys the p(2 x 1) and p(2 x 2) oxygen structures, but the 2D-oxide structure is left nearly unchanged. Beyond 1.5 x 10^{15} cm^{-2} (oxidized surface), the work function minimum rises very rapidly with the oxygen coverage, as tungsten oxides begin to form. On bulk tungsten oxide layers, cesium appears to diffuse into the oxide, possibly forming a cesium tungsten bronze, characterized by

a new desorption state. The thermal stability of the 2D-oxide structure on W(110) and the facetting of less dense tungsten planes suggest a way to achieve stable low work functions of interest in thermionic energy conversion applications.

27399 **Theory of emission spectra from metal films irradiated by low energy electrons near normal incidence.** Kretschmann, E.; Callcott, T.A.; Arakawa, E.T. (Oak Ridge National Lab., TN (USA). Health and Safety Research Div.). *Surface Science ;* **91**: No. 1-3, 237-244(Jan 1980).

The emission spectrum produced by low energy electrons incident on a rough metal surface has been calculated for a roughness auto-correlation function containing a prominent peak at a high wave vector. For low energy electrons near normal incidence, the high wavevector peak dominates the roughness coupled surface plasmon radiation (RCSPR) process. The calculation yields estimates of the ratio of RCSPR to transition radiation, the dependence of emission intensity on electron energy and the shape and position of the RCSPR peak. The most interesting result is that the high-wavevector roughness can split the RCSPR radiation into peaks lying above and below the asymptotic surface plasma frequency. The results are compared with data from Ag in the following paper.

27400 **Radiation from silver films bombarded by low-energy electrons.** Chung, M.S.; Callcott, T.A.; Kretschmann, E.; Arakawa, E.T. (Oak Ridge National Lab., TN (USA). Health and Safety Research Div.). *Surface Science ;* **91**: No. 1-3, 245-263(Jan 1980).

Emission spectra from Ag films irradiated by low energy electrons (20-1500 eV) have been measured, and the results compared with theory. For relatively smooth films, two peaks in the spectra are resolved. One at 3.73 eV, the volume plasmon energy, is attributed to transition radiation and/or bremsstrahlung. The second, at about 3.60 eV, is very sensitive to surface roughness in both position and magnitude and is produced by roughness-coupled radiation from surface plasmons. For rough films, the roughness-coupled radiation dominates the emission. In addition to spectral shapes, the polarization of the radiation and its intensity as a function of electron energy were measured. The experimental results are compared with new calculations of roughness-coupled emission which account for most of our observations. They indicate that high wavevector roughness components play the dominant role in the emission process.

27401 **Electrorefining and electrowinning of gadolinium in a molten fluoride electrolyte purified by pre-electrolysis.** Bratland, D.; Gschneidner, K.A. (Ames Lab., IA (USA)). *Acta Chemica Scandinavica, Series A: Physical and Inorganic Chemistry ;* **34**: 683-686(1980).

Commercial gadolinium was electrorefined in an LiF-GdF_3 melt that had been pre-electrolyzed in an anodic graphite cell to remove dissolved oxide and hydroxide. When the metal was electrorefined with a stationary cathode, the impurities of oxygen, hydrogen and nitrogen were higher than when the cathode was gradually pulled out of the electrolyte. The effect is particularly pronounced for nitrogen. The metal electrowon from a purified electrolyte contained about the same amount of oxygen and hydrogen impurities, but only about one tenth as much nitrogen as the electrorefined metal. The purification with respect to oxygen, hydrogen and nitrogen was comparable or better than results obtained in an electrolyte where the constituents, LiF and GdF_3, were ultrapure.

3602 Ceramics, Cermets, And Refractories

REFER ALSO TO CITATION(S) 26736, 26759, 26761, 26811, 27276, 27276, 27334, 27382, 27518, 27519, 27520

27402 **(CONF-810630—7) First piezoelectric detection of optoacoustic spectra at cryogenic temperatures: cubic neodymium sesquioxide below 10K.** Shaw, R.W.; Howell, H.E. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 12p. NTIS, PC A02/MF A01. Order Number DE81024130.

From 2. international photoacoustic spectroscopy conference; Berkeley, CA, USA (22 Jun 1981).

A piezoelectric detector for optoacoustic spectroscopy at cryogenic temperatures is reported. High resolution spectra of neodymium sesquioxide below 10K are presented to demonstrate its utility.

27403 **(CONF-810696—1) Thermal expansion of molten uranium dioxide.** Drotning, W.D. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 17p. NTIS, PC A02/MF A01. Order Number DE81023163.

From 8. international thermal expansion symposium; Gaithersburg, MD, USA (Jun 1981).

The density and thermal expansion of molten UO_2 were measured from 3120 to 3250°K using the gamma attenuation technique. The density-temperature relation for molten UO_2 was found to be rho(T) = (8.86 +- 0.06) - (9.16 +- 0.43) x 10^{-4} x (T - 3120°K) for rho in g/cm^3 and T in °K. The results agreed within experimental error with the single previous measurement. However, the value of the first derivative of density in the molten phase with respect to temperature was found to be approximately 50% higher than the value recommended in a review of properties for reactor safety analysis. 4 figures.

27404 **(GEPP-TIS—472) Thermal diffusivities of molybdenum/alumina cermets.** Miller, H.C. (General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.). 19 Jun 1981. Contract AC04-76DP00656. 13p. NTIS, PC A02/MF A01. Order Number DE81026679.

The thermal diffusivities of several molybdenum/alumina cermets were measured using a transient heat flow, semi-infinite plate method. The cermets had thermal diffusivities significantly greater than those of a 94% Al_2O_3 alumina. A 50/50 wt% cermet had a thermal diffusivity of 0.102 cm^2/s at 313°K, while the alumina had a value of 0.067 cm^2/s.

27405 (ORNL/FMP—81/2, pp 221-224) **Gaseous corrosion resistance of refractories for coal gasifiers.** Raymon, N.; Heystek, H. (Bureau of Mines, Tuscaloosa, AL). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

Results obtained from DOE-sponsored studies at Virginia Polytechnic Institute and State University indicate that carbon monoxide in typical coal gasifier atmospheres may have the potential to rapidly disintegrate iron-containing refractory lining materials under static conditions. An objective of this program is to substantiate this study of CO disintegration by evaluating results of exposure tests of refractories to high-pressure gasification atmospheres under dynamic conditions. Effects of iron, alkali, and stainless steel fiber-reinforcement on refractory degradation in these conditions are included in the study. Another objective in this research is to evaluate candidate refractory liner materials for the ICGG-CoGas coal gasifier. Exposure tests will be conducted in steam and CO/H_2O environments at 1000°C and 105 psig. The refractory specimens to be exposed will be supplied by Dravo Corporation and will involve about 700 control and exposure specimens. Characterization tests will include bulk density, apparent porosity, dimensional change, modulus of rupture and abrasion resistance. Refractory failure due to attack by alkalis which have been transported in the vapor phase to the refractory face has occurred recently at the Grand Forks Energy Technology Center. This gasifier processes lignite that has ash containing approximately 5 pct Na_2O, and a thick buildup of condensed Na_2O was associated with the refractory failures. An additional objective of this program is to evaluate refractory liner materials for their resistance to Na_2O attack under conditions similar to those prevailing in the Grand Forks Gasifier.

27406 (ORNL/FMP—81/2, pp 229-241) **Creep behavior of refractory concretes.** Smyth, J.R.; McGee, T.D. (Iowa State Univ., Ames). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

There are three main objectives of this present work: (1) to evaluate the long-time creep behavior of high-alumina refractory concretes as related to starting composition and microstructure, and

to microstructural changes; (2) to determine the creep mechanisms in these materials as a function of composition and stress-strain/temperature history; and (3) to obtain data that can be used in mathematical models developed in DOE's materials for coal conversion programs.

27407 (ORNL/FMP—81/2, pp 243-274) **Thermomechanical model for refractory concrete liner anchor interaction.** Buyukozturk, O.; Tseng, T.M. (Massachusetts Inst. of Tech., Cambridge). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

The objectives of this study are: (a) to develop a numerical capability model to predict the stress and strain distribution during the heat-up and cool-down cycles of refractory concrete lined coal gasification vessels; (b) to provide a behavioral understanding of the degradation process in concrete such as cracking and creep; and (c) through parameter studies to arrive at specific guidelines for an optimal design. The model includes nonlinear stress-strain relations under multiaxial cyclic stress states and temperature-dependent creep laws. The objective is also to recommend design criteria which include optimum heating schedule, material property combinations, and anchor configurations. In this quarter, for the experimental part of the study, building of the biaxial compression testing frame, the required measuring devices, and the furnace were completed. Preliminary tests, including uniaxial monotonic, uniaxial cyclic and biaxial monotonic tests, were performed on Litecast 75-28 insulating material. The results provide a basic understanding of the material behavior under loads. For the analytical part of the study, two constitutive models, i.e., the nonlinear orthotropic elastic model and the plastic-fracturing model, were formulated for the refractory concrete. The material functions which need to be identified are, for the orthotropic model, uniaxial stress-strain relationship, failure surface in the principal stress space and equivalent uniaxial strain space, and for the plastic-fracturing model, loading surfaces, fracturing surfaces, hardening rule and softening rule. (DMC)

27408 (ORNL/FMP—81/2, pp 275-279) **Investigation of carbon monoxide disintegration of refractories in coal gasifiers.** Jayatilleke, W.; Martin, C.; Brown, J.J. Jr. (Virginia Polytechnic Inst. and State Univ., Blacksburg). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

Refractories used in coal gasification vessels and piping are exposed to mixtures of hydrogen, steam, hydrogen sulfide, methane, carbon monoxide, and other gases over a wide range of temperatures and pressures. Many refractories are known to deteriorate when exposed for long periods of time to CO-containing atmospheres; especially if the temperature is below about 1300°F and if the refractory contains any iron containing compounds. The objectives of this investigation are to determine: (1) whether or not CO disintegration is likely to occur in the refractories used in coal gasifiers; and (2) to identify the conditions under which CO disintegration of the refractories can be expected to be a serious problem. It is also a goal of this investigation to develop information that will assist in the identification of refractory deterioration or failure that is caused by CO disintegration. The results of exposing a generic 50% alumina castable to a variety of CO-containing atmospheres are summarized.

27409 (ORNL/FMP—81/2, pp 293-298) **Refractories in slagging gasifiers.** Muan, A. (Pennsylvania State Univ., University Park). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

This research is concerned with the chemical parameters determining the limiting conditions for the performance of oxide refractories in slagging coal gasifiers. Special attention is given toward chromium oxide-containing refractories (mainly Al_2O_3-Cr_2O_3 solid solutions and various chromite phases), inasmuch as the solubility of chromium oxide in silicate liquids is unusually low under most conditions involved in coal gasifiers. In order to provide the data base needed for understanding such reactions, equilibrium relations are being determined for a number of oxide combinations representing simplified coal-ash slags in the system CaO-FeO-Al_2O_3-SiO_2 in conjunction with refractory oxide components (MgO, Al_2O_3, Cr_2O_3). Inasmuch as iron, in particular, and chromium to some extent, occur in several valence states in oxide phases, the phase relations in systems involving these elements are dependent on the oxygen potential under which the reactions take place. The present work is, therefore, carried out under carefully controlled atmospheric conditions. Most of the work is being done under the relatively reducing conditions of a CO_2-H_2 atmosphere of ratio CO_2/H_2 = 10/1, while additional equilibrium runs are being made in CO_2 or air.

27410 (ORNL/FMP—81/2, pp 353-359) **High temperature applications of structural ceramics.** Fuller, E.R.; Fields, R.J.; Chuang, T.J.; Hahn, T.A.; Schneider, S.J. (National Bureau of Standards, Washington, DC). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

The achievement of higher efficiency thermochemical engines and heat recovery systems requires the availability of high temperature, high performance structural materials. Structural ceramics such as SiC, Si_3N_4 and certain Al_2O_3-Si_3N_4 combinations have received particular attention for these applications due to their basic characteristics of good strengths coupled with good corrosion and thermal shock resistances. Even with these positive attributes, improved reliabilities and extended lifetimes under service conditions are necessary for structural ceramics to gain industrial acceptance and use. The problems are mechanical and/or chemical in nature and are enhanced by the fact that these materials are subjected to high temperatures, reactive environments and extreme thermal gradients. With an objective of improved performance for heat engine/heat recovery applications the NBS program on structural ceramics addresses these problems through the determination of the critical factors which influence mechanical and microstructural behavior. The activities of the program are grouped under four major subtasks, high temperature fracture of structural ceramics, crack growth mechanisms, microstructure and phase alteration, and microstructure and fracture in reactive environments. Each subtask is designed to develop key data, associated test methods and companion predictive models. The status of each subtask is discussed in detail.

27411 (ORNL/FMP—81/2, pp 361-367) **Materials for ceramic heat exchangers.** Tennery, V.J.; Becher, P.F. (Oak Ridge National Lab., TN). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

The use of structural ceramics in heat exchanger (HX) applications must consider not only the long-term stability of these materials in the severe environments of coal-fired systems but also the microstructural-compositional factors that influence their chemical and mechanical response under such conditions. To this end mechanical properties of several commercial silicon nitride and carbide ceramics are being examined before and after exposure to the hot combustion product environment of various coal-oil mixtures (COM) having different coal ash compositions. In Combustion Exposure Test 1 (CE 1), flexural specimens are being studied for microstructural-compositional and mechanical changes brought about by long-term exposure at about 1220°C to the slag from the combustion of an acidic COM.

27412 (SAND—81-1456C) **Shock-induced chemical and structural modification of zirconia, lead oxide and their mixed powders.** Keck, J.D.; Hankey, D.L.; Graham, R.A.; Morosin, B. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 5p. (CONF-810684—28). NTIS, PC A02/MF A01. Order Number DE81024081.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

Results of an exploratory study of zirconia, lead oxide and their mixed powders which have been subjected to shock compression and preserved for subsequent study are reported. A single shock-induced modification experiment on a lead, tin, zirconate system with a Nb_2O_5 additive was conducted.

27413 Electron-energy-loss- and ultraviolet-photoemission-spectroscopy study of the VN/sub x/ system. Schubert, W.K.; Shelton, R.N.; Wolf, E.L. (Ames Laboratory, U.S. Department of Energy, Iowa State University, Ames, Iowa 50011). Contract W-7405-ENG-82. *Physical Review [Section] B: Condensed Matter ;* **23**: No. 10, 5097-5106(15 May 1981).

Reflection electron-energy-loss spectroscopy (ELS) and ultraviolet-photoemission spectroscopy (UPS) have been used to study the electronic properties of VN/sub x/ ($0.0 < \text{or} = x < 0.96$). Polycrystalline samples of several compositions have been fabricated with special care to avoid oxygen contamination. ELS is used to examine the collective oscillations ("plasmons") of the valence electrons, and one-electron core-level excitations, while angle-integrated UPS experiments using the resonance lines of He and Ne are used to probe the valence-band density of states. The ELS experiments are the first of this type on any of the transition-metal nitrides or carbides, while the UPS results are the first reported for VN/sub x/. Good overall agreement is found with the calculated density of states of Neckel et al. The experimental results seem to indicate that composition changes result in a reshaping of the hybridized (V-3d)+(N-2p) valence band rather than a simple rigid-band—like shift of the Fermi level.

27414 Interaction of cesium and oxygen on W(110). Pt. 2. Codeposition: Cesium oxide formation. Papageorgopoulos, C.A.; Desplat, J.L. (National Aeronautics and Space Administration, Moffett Field, CA (USA). Ames Joint Inst. for Surface and Microstructural Research; Rasor Associates, Inc., Sunnyvale, CA (USA)). *Surface Science ;* **92**: No. 1-3, 119-132(Feb 1980).

The codeposition of cesium and oxygen on W(110) has been studied by work function measurements, Auger electron and energy loss spectroscopies and thermal desorption. Thick layers of cesium oxide are grown on the substrate and their properties depend on which of the two constituents is in excess in the incident fluxes. With an excess of cesium, work functions between 0.9 and 1 eV are obtained for thicknesses around 30 A, and the main cesiated desorption product is Cs_9O which has a desorption energy of 1.2 eV. We propose that Cs_2O is grown on the surface and that it does not include a large amount of Cs doping. With an excess of oxygen, it is suggested that part of it is imbedded in the Cs_2O matrix. A reaction with the substrate occurs below 900 K, leading to the formation of a ternary compound, possibly a cesium tungsten bronze.

27415 He^+ ion-scattering spectroscopy studies of UO_2(hkl) surfaces. Ellis, W.P.; Taylor, T.N. (Los Alamos Scientific Lab., NM (USA)). *Surface Science ;* **91**: No. 1-3, 409-422(Jan 1980).

Structural aspects of the (110), (100) and (111) planar surfaces of UO_2 have been studied by 500 eV He^+ ISS. Measurements of the He^+/U signal as a function of polar, β, and azimuthal, phi, angles of incidence indicate for the (110) that U and O are coplanar: Only one critical blocking angle at βsub(c) = 87° was observed. In a vivid example of sensitivity to surface processes, as the temperature of (110) was raised to where faceting begins, the He^+/O signal became very strong and He^+ U disappeared. For the (100), two He^+ U βsub(c) were observed and interpreted as resulting from oxygen in two bridge-bonding orientations. Previous (111) results were confirmed and, when extended to include other phi, were in agreement with the center-bonded oxygen model. Difficulties in establishing a defined He^+/U scattering mechanism are discussed.

3603 Composite Materials

REFER ALSO TO CITATION(S) 26759

27416 (UCRL—85789) FTIR studies of the chemical structure of high-performance composite matrices. Mones, E.T.; Morgan, R.J. (Lawrence Livermore National Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 9p. (CONF-810813—6). NTIS, PC A02/MF A01. Order Number DE81021060.

From National American Chemical Society summer meeting; New York, NY, USA (23 Aug 1981).

Diaminodiphenyl sulfone (DDS) cured tetraglycidyl 4, 4'-diaminodiphenyl methane (TGDDM) epoxies are currently the most commonly used matrices for high-performance fibrous composites. Fourier-transform infrared spectroscopy (FTIR) studies of the cure reactions of these epoxies are reported as a function of cure conditions. From these studies, the TGDDM epoxide was found to undergo intermolecular homopolymerization to form ether linkages in the absence of DDS. The epoxide groups can also isomerize. Such reactions are accelerated by epoxide impurities and a BF_3 catalyst, and also occur in the presence of DDS. For TGDDM-DDS systems epoxide-amine addition reactions occur but generally the secondary amine is never all consumed. Also intramolecular TGDDM epoxide homopolymerization occurs in the presence of DDS to form six membered morpholine rings. The chemical structures of commercial TGDDM-DDS epoxies are discussed in the light of these observations. Such structures are correlated with the physical and mechanical properties of these systems.

3604 Polymers And Plastics

REFER ALSO TO CITATION(S) 27436

27417 (DOE/ER/05947—T1) Synthesis and characterization of novel polymers from non-petroleum sources for use in enhanced oil recovery. (Florida Univ., Gainesville (USA)). Apr 1981. Contract AS05-78ER05947. 17p. NTIS, PC A02/MF A01. Order Number DE81024388.

Progress reports are presented for: synthesis and structural characterization of polysaccharide-based graft copolymers for use in tertiary oil recovery; and determination of physical properties of these polymers and their solutions, and screening of the polymers to determine their utility in oil recovery. Over the past year, synthesis and characterization studies were in the following areas: starch-g-polyacrylamide (ST-g-PAM) copolymers; graft copolymers of other polysaccharides (locust bean gum and guar gum) and acrylamides; chain extended polysaccharides; chemical degradation of ST-g-PAM copolymers; and gel permeation chromatography of ST-g-PAM, and homopolyacrylamide standards. Physical properties studies have been carried out in the following areas: filtration using Nucleopore filters to determine molecular size and molecular size distribution of the synthesized polymers; development of a rotational cylinder viscometer for the measurement of very low shear rate viscosities and for the description of creep-recovery relaxation times of polymer solutions; structure-rheology relationships of several prepared LBG graft copolymers; preparations for the determination of molecular weights by ultracentrifugation; and filtration studies.

27418 (UCRL—15362) Polymer-filler studies. Farris, R.J.; Karasz, F.E. (California Univ., Livermore (USA). Lawrence Livermore Lab.; Massachusetts Univ., Amherst (USA)). Aug 1980. Contract W-7405-ENG-48. 46p. NTIS, PC A03/MF A01. Order Number DE81026596.

This study examined the matrix-filler interactions in model systems consisting of representative polymers with polycrystalline fillers in situations in which the volume content of the latter exceeds 80%. Several techniques were used including methods to study: (1) the disposition and gross morphology of the minor (polymeric) component; (2) wetting of a filler crystal by molten polymer; and (3) theoretical and experimental studies related to optimum loading.

27419 (UCRL—85838) Bound water in Kevlar 49 fibers. Garza, R.G.; Pruneda, C.O.; Morgan, R.J. (Lawrence Livermore National Lab., CA (USA)). 1 Apr 1981. Contract W-7405-ENG-48. 8p. (CONF-810813—5). NTIS, PC A02/MF A01.

From National American Chemical Society summer meeting; New York, NY, USA (23 Aug 1981).

From elemental analyses, thermogravimetric-mass spectroscopy studies and re-evaluation of previous water diffusion studies in Kevlar 49 fibers it is concluded that these fibers can contain two types of sorbed moisture. The fibers can absorb up to ~ 6 wt % loosely bound water with an activation energy for outgassing by desorption of 6 kcal/mole. This loosely bound water is a direct result of the presence of Na_2SO_4 impurities and the perturbations they induce on the packing of the rod-like poly (p-phenylene terephthalamide) macromolecules. Kevlar 49 fibers also inherently

contain up to 30 wt % additional water which is tightly bound within the crystal lattice. This water exhibits an activation energy for outgassing by diffusion of ~ 40 kcal/mole and is only evolved from the fiber in significant quantities at t > 350°C over a period of hours.

3606 Other Materials

REFER ALSO TO CITATION(S) 26897, 26907, 26921, 26923, 26987, 27137, 27138, 27163, 27459, 27459, 27581, 27614, 27945, 27946

27420 (CONF-810604—3) Use of run statistics to validate tensile tests. Eatherly, W.P. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 3p. NTIS, PC A02/MF A01. Order Number DE81024120.

From 15. biennial conference on carbon; Philadelphia, PA, USA (22 Jun 1981).

In tensile testing of irradiated graphites, it is difficult to assure alignment of sample and train for tensile measurements. By recording location of fractures, run (sequential) statistics can readily detect lack of randomness. The technique is based on partitioning binomial distributions.

27421 (CONF-810604—4) Out-of-pile bench test of a 1200°C graphite creep irradiation test. Senn, R.L.; Roland, H.C. (Oak Ridge National Lab., TN (USA); Tennessee Univ., Knoxville (USA)). 1981. Contract W-7405-ENG-26. 5p. NTIS, PC A02/MF A01. Order Number DE81024117.

From 15. biennial conference on carbon; Philadelphia, PA, USA (22 Jun 1981).

A series of irradiation tests designed to determine the creep characteristics of various graphites of interest to nuclear reactor designers is currently underway. Three temperature regimes, 600, 900, and 1200°C are being investigated. Four of these experiments, two at 600°C and two at 900°C specimen temperature have been completed and described previously. A similar experiment to be operated at 1200°C specimen temperature is being planned. An out-of-pile (unirradiated) bench test was required to develop the high temperature design. The capsules for these experiments are being irradiated in the E-5 core position of the 30-MW Oak Ridge Research Reactor (ORR).

27422 (CONF-810604—6) Evaluation of fracture strength by sonic testing. Kennedy, C.R. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 3p. NTIS, PC A02/MF A01. Order Number DE81024119.

From 15. biennial conference on carbon; Philadelphia, PA, USA (22 Jun 1981).

The Griffith-Irwin equation is used to describe the fracture characteristics of graphite. The material constants, Young's modulus and mean flaw size, are measured sonically from velocity and attenuation measurements. The effects of steam oxidation and neutron irradiation on fracture strength are shown to be predictable assuming a constant strain-energy release rate.

27423 (ORNL/FMP—81/2, pp 281-282) Determining the resistance of refractories to corrosion-erosion by molten slag. Kennedy, C.R. (Argonne National Lab., IL). Jul 1981. NTIS, PC A17/MF A01.

In AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981.

Highlights of the program are briefly summarized in this report. The purpose of this program is to: (1) determine which commercial refractories are most likely to withstand environments encountered in slagging gasification processes; (2) identify grain bond systems which hold potential for improved refractory performance; and (3) establish mechanisms of degradation at refractory-slag interfaces. This established laboratory program examines acidic and basic slags at temperatures to 1600°C in contact with specially fabricated as well as commercially available refractory bricks, with and without water cooling, to establish the corrosion-erosion behavior of the bricks. This program is providing much of the information needed to select appropriate refractories for slagging processes. Several reports containing critical information are already available, and a mechanistic understanding of the effects of slag composition on refractory performance is being developed. Efforts this quarter have centered on quantitative microprobe studies of the reaction layers of refractories exposed to a high iron oxide (20 wt %) acidic coal slag in test run 12. All of the refractories in this test were found to have reacted with the coal slag to form complex $(Fe,Mg)(Al,Cr)_2O_4$ spinels. The amount of iron oxide in the reaction layer immediately adjacent to the slag was found to increase significantly as the chromia content in the refractory was increased. This behavior has been shown to be consistent with the $FeO\text{-}Al_2O_3$ and $FeO\text{-}Cr_2O_3$ phase diagrams.

27424 (SAND—81-8211) Dimensional instabilities in Min-K 1400 above its expected service temperature. Even, W.R.; Manesis, N.J.; Skibo, M.D. (Sandia National Labs., Livermore, CA (USA)). May 1981. Contract AC04-76DP00789. 26p. NTIS, PC A03/MF A01. Order Number DE81025046.

The response of Min-K 1400 to temperatures in excess of its recommended service limits has been investigated. Severe, irreversible shrinkage was observed at temperatures greater than 1000°C. The shrinkage was found to be anisotropic and related to the direction of fiber reinforcement. The extent and rate of shrinkage was quantified. There was no evidence of crystallization or new phase formation associated with the densification.

27425 Rotational cooling and electronic relaxation in diazabenzenes. Jameson, A.K.; Okajima, S.; Lim, E.C. (Department of Chemistry, Wayne State University, Detroit, Michigan 48202). *Journal of Chemical Physics ;* **75**: No. 1, 480-482(1 Jul 1981).

Rotational cooling of fluorescence of diazabenzene is considered. (AIP)

27426 S-d transition in compressed lanthanum. McMahan, A.K.; Skriver, H.L.; Johansson, B. (Lawrence Livermore National Laboratory, University of California, Livermore, California 94550). *Physical Review [Section] B: Condensed Matter ;* **23**: No. 10, 5016-5029(15 May 1981).

Calculations of the pressure-volume isotherms for fcc La have been carried out up to pressures of 2 Mbars and temperatures up to 3.4 eV, using the self-consistent linear-muffin-tin-orbital method. The isothermal bulk modulus shows an anomalous stiffening over the pressure range 320—560 kbars, due to termination of the 6s to 5d electronic transition. The effect is calculated to be most pronounced at zero temperature and is largely washed out by a temperature of 3.4 eV. These results lead to a temperature-dependent peak in the lattice Grueneisen parameter, based on a simple Slater-model analysis. Hugoniot calculations using this Grueneisen parameter are in good agreement with experiment and reproduce the anomalous stiffening observed in the shock compression data for La. While we also find both significant overlap of the rare-gas cores and melting to occur in the vicinity of the shock anomaly, the present calculations identify the principal cause of the anomaly observed in the La shock data to be the termination of the 6s-5d electronic transition in this material.

27427 Lattice dynamics of $CeSn_3$. Stassis, C.; Loong, C.; Zarestky, J.; McMasters, O.D.; Nicklow, R.M. (Ames Laboratory, U. S. Department of Energy, Iowa State University, Ames, Iowa 50011). *Physical Review [Section] B: Condensed Matter ;* **23**: No. 10, 5128-5136(15 May 1981).

Inelastic neutron scattering techniques have been used to measure the phonon dispersion curves of $CeSn_3$ at room temperature and the frequencies of a selected number of phonons at 10 K. We find that in the [111] symmetry direction the measured frequencies in the vicinity of the first R/sup prime/$_{25}$ zone-boundary point are considerably lower than those of the isostructural compound $LaSn_3$. Examination of the relative motion of the nuclei of $CeSn_3$ in this mode of vibration shows that this pronounced anomaly may be attributed to mixed-valence effects on the phonon frequencies. We did not observe, on the other hand, any significant anomalies in the widths of the measured neutron groups, and we estimated that any lifetime effects due to the electron-phonon coupling in $CeSn_3$ are certainly smaller than approximately 0.15 THz. Also we find that the temperature dependence of the phonon frequencies is normal and can be accounted for by the effect of the thermal expansion of the lattice on the vibrational frequencies. The force constants ob-

tained by fitting the experimental data to a three-nearest-neighbor Born—von Karman model were used to evaluate the phonon density of states, the lattice specific heat, and the atomic temperature factors of Ce and Sn in this compound.

27428 **Model of crystal potential from axial-channeling radiation.** Swent, R.L.; Pantell, R.H. (Department of Electrical Engineering, Stanford University, Stanford, California 94305). Contract DE-AMO3-76SF00326. *Journal of Applied Physics ;* **52**: No. 5, 3403-3404(May 1981).

One application of radiation from channeled electrons is that the potential in a crystal can be calculated from the measured radiation energies. The procedure is to assume a potential function with undetermined coefficients that can be adjusted so that the energies calculated from this function match the data points. In this manner the potential is determined for the <111> axis in silicon and compared to that obtained from the Moliere approximation to the Thomas-Fermi model.

27429 **Spatially resolved photoconductivity of polycrystalline silicon.** Scholl, F.W. (Department of Electrical Engineering, Columbia University, New York, New York 10027). Contract AC0-79ET23049. *Journal of Applied Physics ;* **52**: No. 5, 3439-3444(May 1981).

Spatially resolved photoconductivity measurements are used to deduce information describing majority carrier current flow and minority carrier grain boundary recombination in solar grade polycrystalline silicon. Relative to the bulk silicon diffusion velocity, grain boundary recombination velocity of S/sub GB/ = 0.28 is measured. Measurements using two superposed light sources show intensity dependent nonlinear recombination processes at the grain boundary. Numerical calculations of grain boundary recombination velocity are presented that clarify the microscopic origin of these nonlinearities.

27430 **Optical properties of Kapton: Measurement and applications.** Arakawa, E.T.; Williams, M.W.; Ashley, J.C.; Painter, L.R. (Health and Safety Research Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). Contract W-7405-ENG-26. *Journal of Applied Physics ;* **52**: No. 5, 3579-3582(May 1981).

The optical properties of Kapton type H polyimide film, obtained from reflectance measurements, are presented for photon energies from 0.5 to 70 eV. Equations for the energy-loss function, with parameters fixed by the optical data, are employed to calculate mean free paths and stopping powers for low-energy electrons (100 eV to 10 keV) in Kapton. The values obtained show good agreement with those predicted by recently proposed analytical formulae for electron mean free paths and stopping powers in solid organic insulators.

27431 **Detection of molecular monolayers by optical second-harmonic generation.** Chen, C.K.; Heinz, T.F.; Ricard, D.; Shen, Y.R. (Department of Physics, University of California, Berkeley, California 94720). Contract W-7405-ENG-48. *Physical Review Letters ;* **46**: No. 15, 1010-1012(13 Apr 1981).

Second-harmonic generation is shown to be sensitive enough to detect molecular monolayers adsorbed on a silver surface. Adsorption of AgCl and pyridine on silver during and after an electrolytic cycle can be easily observed.

27432 **Synergistic effect of electrons on the reactivity of atomic hydrogen with graphite.** Ashby, C.I.H.; Rye, R.R. (Sandia National Labs., Albuquerque, NM (USA)). *Journal of Nuclear Materials ;* **92**: No. 1, 141-143(Aug 1980).

40 CHEMISTRY

4001 Analytical And Separations Chemistry

REFER ALSO TO CITATION(S) 26782, 26782, 26783, 26788, 26885, 26886, 26887, 26888, 26889, 26929, 27011, 27500, 27515

27433 **(CONF-810682—2) Institutional and national representation speakers and topics at five Modern Trend Conferences.** Lyon, W.S. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 15p. NTIS, PC A02/MF A01. Order Number DE81024964.

From 6. international conference: Modern trends in activation analysis; Toronto, Canada (15 Jun 1981).

The first Modern Trends in Activation Analysis Conference at Texas A and M in 1961 listed 23 papers from 19 different North American institutions and 9 papers from 8 different overseas laboratories. Second, third, fourth and fifth conferences were held in 1965 (Texas A and M), 1968 (N.B.S. Washington, DC), 1972 (Saclay, France) and 1976 (Munich, Germany). In contrast to the first conference, at the 1976 Munich meeting 34 papers from 21 different North American laboratories were presented along with 142 papers from 85 different non-North American establishments. The 1981 conference is expected to be even larger. A scientometric study was made of speakers, their institutions and nationalities, included in these five conferences. The objective was to see what patterns of participation could be discerned. In addition program content was evaluated by categorizing papers and ascertaining which topics had declined, grown, or emerged as new trends as the conferences progressed. The results from these studies present an interesting picture of how activation analysis has evolved: some countries that were originally quite active seem to have dropped interest; others have rapidly risen to preeminence. This is especially true of institutions, some of which have even disappeared from the scene. Not too surprisingly some of the speakers at the 1961 conference have appeared on other Modern Trend programs, and a few will probably appear in 1981. Some general conclusions about activation analysis conferences in general and the Modern Trends Conference in particular can be drawn from these and other data.

27434 **(CONF-810682—4) Iodine-129 separation and determination by neutron activation analysis.** Bate, L.C.; Stokely, J.R. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 19p. NTIS, PC A02/MF A01. Order Number DE81023208.

From 6. international conference: Modern trends in activation analysis; Toronto, Canada (15 Jun 1981).

A method is described for analysis of ^{129}I in fission product mixtures originating from fuel reprocessing studies and low-level wastes. The method utilizes conventional iodine valence adjustment and solvent extraction techniques to chemically separate ^{129}I from most fission products. The ^{129}I is determined by neutron irradiation and measurement of the 12.4 h ^{130}I produced by the neutron capture reaction. Special techniques were devised for neutron irradiation of ^{129}I samples in the pneumatic tube irradiation facilities at the High Flux Isotope (HFIR) and Oak Ridge Research (ORR) Reactors. Chemically separated ^{129}I is adsorbed on an anion exchange resin column made from an irradiation container. The loaded resin is then irradiated in either of the pneumatic facilities to produce ^{130}I. Sensitivity of the analysis with the HFIR facility (flux: 5×10^{14} n/cm^2/sec) and a 100-second irradiation time is approximately 0.03 nanograms. Samples up to 250 ml in volume can be easily processed.

27435 **(CONF-8006174—1(Draft)) Reliability of contemporary data-acquisition techniques for LEED analysis.** Noonan, J.R.; Davis, H.L. (Oak Ridge National Lab., TN (USA)). Oct 1980. Contract W-7405-ENG-26. 15p. NTIS, PC A02/MF A01. Order Number DE81024078.

From Conference on determination of surface structures by LEED; Yorktown Heights, NY, USA (19 Jun 1980).

It is becoming clear that one of the principal limitations in LEED structure analysis is the quality of the experimental I-V profiles. This limitation is discussed, and data acquisition procedures described, which for simple systems, seem to enhance the quality of agreement between the results of theoretical model calculations and experimental LEED spectra. By employing such procedures to obtain data from Cu(100), excellent agreement between computed and measured profiles has been achieved. 7 figures.

27436 (DOE/ER/05015—1) Mechanisms of gas permeation through polymer membranes. Progress report, April 30, 1980-March 31, 1981. Stern, S.A.; Kulkarni, S.S.; Mauze, G.R. (Syracuse Univ., NY (USA). Dept. of Chemical Engineering and Materials Science). Apr 1981. Contract AS02-78ER05015. 68p. NTIS, PC A04/MF A01. Order Number DE81025637.

The objective of this study is to assess the validity of a free-volume model of gas permeation through nonporous polymer membranes. This model provides a formalism for the prediction of permeability coefficients for pure gaseous penetrants and their mixtures as a function of both pressure and temperature. Three characteristic free-volume parameters, designated A/sub d/, B/sub d/, and γ, are required for this purpose. The three parameters were determined for CH_4 in polyethylene from diffusivity and solubility measurements with polymer rods between 5 and 35°C, and at pressures of up to 40 atm. Permeability coefficients for CH_4 estimated from the free-volume model by means of these parameters were found to be in satisfactory agreement with experimental values obtained from independent permeability measurements with thin polyethylene membranes. A new and more rigorous method of estimating permeability coefficients for gas mixtures from the free-volume model has been developed. Permeability coefficients were calculated by this method for the components of equimolar C_2H_4-C_3H_8, CO_2-C_2H_4, and CO_2-C_3H_8 mixtures and of a 74.9% CO_2-25.1% C_2H_4 mixture. Satisfactory overall agreement was found between these coefficients and values obtained experimentally between 20 and 50°C and at pressures of up to 28 atm. Simple linear correlations have been found for the free-volume parameters A/sub d/, B/sub d/, and γ as a function of certain basic physicochemical properties of penetrants and penetrant-polymer systems. These correlations can be determined with only a few measurements with a given polymer, and are useful for estimating values of A/sub d/, B/sub d/, and γ for other penetrants in the same polymer. The free-volume model has bee modified and extended to describe gas permeation through both rubbery and glassy polymer membranes. The extended model should be applicable to porous as well as nonporous membranes.

27437 Chemical study of the plate of brass. Michel, H.V.; Asaro, F. (Lawrence Berkeley Lab., CA). *Archaeometry ;* **21**: No. 1, 3-19(1979).

The low level of lead and iron in the Plate of Brass indicates it was made from zinc metal which had probably been produced by the retort process and possibly redistilled. This indicates a date of the nineteenth or twentieth century although a late eighteenth-century date might be possible. The low level of antimony, arsenic, nickel, cobalt, silver, and gold in the Plate of Brass indicates it was made from high purity copper which would not have been generally available until about the middle of the nineteenth century although an eighteenth century date is possible. The high degree of chemical uniformity of the Plate of Brass, better than 0.45% from the zinc to copper ratio, and the small variations in thickness in the areas away from the edges, 0.001 in. are consistent with twentieth-century rolled brass. The average measured thickness of the Plate of Brass away from the edges, 0.129 +- 0.002 in., is consistent with the specifications for No. 8 gage brass of the American Wire Gage standard used in the 1930s. The Plate of Brass therefore was made in the eighteenth to the twentieth centuries. The most probable period is the late nineteenth and early twentieth centuries. 7 tables.

27438 (LA-UR—81-1736) Application of cryogenic spectroscopy to the determination of impurity concentration in coal gasifiers. Holland, R.F.; Quigley, G.P. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 18p. (CONF-810607—9). NTIS, PC A02/MF A01. Order Number DE81025410.

From Symposium on instrumentation and control for fossil energy processes; San Francisco, CA, USA (8 Jun 1981).

A number of small molecules are soluble at low-to-moderate concentrations in the ir-transparent liquefied rare gases. As part of an effort to develop methods to measure concentrations of minor constituents in product gases from coal gasifiers, we have measured the infrared spectral absorbance of solutions produced by sampling cryogenically a mixture of gases and dissolving the sample in liquid xenon. Observations thus far include CO_2, CO, CH_4, and H_2 as major constituents and NO_2, NO, NH_3, N_2O, SO_2, and COS as minor constituents in the mixture. For low concentrations in the cold solutions, solute absorption bands are narrow, with widths at half-maximum absorbance of 1 to 10 cm^{-1} compared with ~ 30 to 100 cm^{-1} for the gas phase. The band-narrowing enhances peak absorbance and reduces spectral overlapping for easier analysis of complex mixtures. In the sampling, we remove most CO and CH_4, so that only the CO_2 interferes with the spectrum of minor constituents. In the spectra we can distinguish bands of N_2O, SO_2, COS, and NO_2 (as N_2O_4) and estimate concentrations. The sensitivity and accuracy of the cryogenic solution technique for gas analysis are not yet established; however, detection of ~ 10 ppM appears possible with a half-inch absorption cell.

27439 (LA-UR—81-1810) Automated activation-analysis system. Minor, M.M.; Hensley, W.K.; Denton, M.M.; Garcia, S.R. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 16p. (CONF-810682—6). NTIS, PC A02/MF A01. Order Number DE81025307.

From 6. international conference: Modern trends in activation analysis; Toronto, Canada (15 Jun 1981).

An automated delayed neutron counting and instrumental neutron activation analysis system has been developed at Los Alamos National Laboratory's Omega West Reactor (OWR) to analyze samples for uranium and 31 additional elements with a maximum throughput of 400 samples per day. The system and its mode of operation for a large reconnaissance survey are described.

27440 (LA-UR—81-1989) In-line measurement of plutonium and americium in mixed solutions. Li, T.K. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 5p. (CONF-810706—10). NTIS, PC A02/MF A01. Order Number DE81025377.

From Institute of Nuclear Materials Management conference; San Francisco, CA, USA (13 Jul 1981).

A solution assay instrument (SAI) has been developed at the Los Alamos National Laboratory and installed in the plutonium purification and americium recovery process area in the Los Alamos Plutonium Processing Facility. The instrument is designed for accurate, timely, and simultaneous nondestructive analysis of plutonium and americium in process solutions that have a wide range of concentrations and Am/Pu ratios. For a 25-mL sample, the assay precision is < 1%, both for plutonium and for americium having concentrations >5 g/L within a 2000-s count time.

27441 (LBL—12580) Microprocessor controlled anodic stripping voltameter for trace metals analysis in tap water. Clem, R.G.; Park, F.W.; Kirsten, F.A.; Phillips, S.L.; Binnall, E.P. (Lawrence Berkeley Lab., CA (USA)). Apr 1981. Contract W-7405-ENG-48. 22p. (CONF-810813—7). NTIS, PC A02/MF A01. Order Number DE81025210.

From National American Chemical Society summer meeting; New York, NY, USA (23 Aug 1981).

The construction and use of a portable, microprocessor controlled anodic stripping voltameter for on-site simultaneous metal analysis of copper, lead and cadmium in tap water is discussed. The instrumental system is comprised of a programmable controller which permits keying in analytical parameters such as sparge time and plating time; a rotating cell for efficient oxygen removal and amalgam formation; and, a magnetic tape which can be used for data storage. Analysis time can be as short as 10 to 15 minutes. The stripping analysis is based on a pre-measurement step during which the metals from a water sample are concentrated into a thin mercury film by deposition from an acetate solution of pH 4.5. The concentrated metals are then electrochemically dissolved from the film by application of a linearly increasing anodic potential. Typical peak-shaped curves are obtained. The heights of these curves are related to the concentration of metals in the water by calibration data. Results of tap water analysis showed 3 +- 1 μg/L lead, 22 +- 0.3 μg/L copper, and less than 0.2 μg/L cadmium for a Berkeley, California tap water, and 1 to 1000 μg/L Cu, 1 to 2 μg/L Pb for ten samples of Seattle, Washington tap water. Recommendations are given for a next generation instrument system.

27442 (ORNL/TM—7881) Mass spectrometric determination of moisture. Walton, J.R. (Oak Ridge National Lab., TN (USA)). Jul 1981. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE81027075.

A method has been developed to accurately determine the moisture content in gases and hydrated salts by analytical mass spectrometry. The moisture reacts with calcium carbide, CaC_2, to form acetylene, C_2H_2, which is easily measured quantitatively. The moisture in ambient air, argon standards, barium chloride, and oxalic acid have been determined.

27443 Optimization of a kinetic method by response surface methodology and centrifugal analysis and application to the enzymatic measurement of ethanol. Burtis, C.A.; Bostick, W.D.; Overton, J.B.; Mrochek, J.E. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Analytical Chemistry ;* **53**: No. 8, 1154-1159(Jul 1981).

Response surface methodology (RSM) offers the analytical chemist a statistically sound, efficient, and effective means for developing, evaluating, and optimizing analytical methods. To assist in processing the analytical workload generated by RSM, we have utilized a centrifugal analyzer. Thus, each analytical run in the centrifugal analyzer can be considered as an individual experiment and several samples, including calibrators, synthetic and authentic specimens, etc., can be simultaneously processed and analyzed under a single set of conditions. Depending on the samples used, several analytical responses such as linearity, precision, accuracy, dynamic range, specificity, and sensitivity can be measured for each set of experimental conditions. The advantages realized in combining these two technologies are demonstrated in the optimization of a kinetic method for the enzymatic measurement of ethanol.

27444 Liquid chromatographic determination of benzo[a]pyrene in natural, synthetic, and refined crudes. Tomkins, B.A.; Reagan, R.R.; Caton, J.E.; Griest, W.H. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Analytical Chemistry ;* **53**: No. 8, 1213-1217(Jul 1981).

Benzo[a]pyrene (BaP) is isolated and quantitated by using a sequential high-pressure liquid chromatographic (HPLC) procedure. The sample is first injected onto a semipreparative HPLC column containing a bonded polar aminocyano (PAC) packing material, from which a BaP-enriched fraction is obtained. This isolate is then reinjected onto a Zorbax ODS reversed-phase analytical-scale column, and fluorescence detection is used to quantitate BaP. This procedure is applicable to samples with BaP concentrations ranging from 0.02 to 500 μg/g. The precision is nominally +- 6% (relative standard deviation), and the accuracy compares favorably with that displayed by more tedious methods. Recoveries, as determined by counting a radioactive BaP tracer, usually exceed 95%. Two samples may be processed per person-day.

27445 Nonaqueous on-line simultaneous determination of metals by size exclusion chromatography with inductively coupled plasma atomic emission spectrometric detection. Hausler, D.W.; Taylor, L.T. (Virginia Polytechnic Inst. and State Univ., Blacksburg). Contract AC22-80PC30041. *Analytical Chemistry ;* **53**: No. 8, 1223-1227(Jul 1981).

The development of a simultaneous on-line detector for metal species separated by effective molecular size is described. A new spray chamber to facilitate this analysis in relatively high-volatility organic solvents and to serve as the interface between a liquid chromatography (LC) and an inductively coupled plasma atomic emission spectrometer (ICP-AES) is evaluated. Detection limits in toluence are comparable to those found in aqueous static operation of ICP-AES. The requirements of computer-based data output and examples of the output developed are presented. The LC-ICP interface is demonstrated by size separation of three synthetic mixtures. Two of the mixtures are iron and silicon organometallic species with different ligands attached, while the third mixture consists of approximately 20 different metals in essentially the same ligand environment.

27446 Separation of plutonium in urine without sample ashing for determination by α-spectrometry. Kressin, I.K. (Univ. of California, Los Alamos, NM). Contract W-7405-ENG-36. *Analytical Chemistry ;* **53**: No. 8, 1270-1274(Jul 1981).

Present methods for the analysis of plutonium in urine require ashing the organic constituents of the sample, a time-consuming procedure and a major source of error. A method was developed to quantitatively separate 25 fCi of plutonium directly from 800 cm^3 of urine by coprecipitation with calcium oxalate. Without ashing, the oxalate precipitate is directly dissolved in 7.2 M HNO_3 and the plutonium is isolated by anion exchange, electrodeposited, and then measured by α-spectrometry. The results are in excellent agreement with results obtained by existing procedures, and for 194 samples the average recovery of the plutonium tracer was 91% with a standard deviation of +- 10. The average recovery of the plutonium isotope in quality control samples was 101% when corrected for the ^{242}Pu tracer recovery.

27447 High-resolution NMR spectra in inhomogeneous magnetic fields: application of total spin coherence transfer echoes. Weitekamp, D.P.; Garbow, J.R.; Murdoch, J.B.; Pines, A. (Univ. of California, Berkeley). Contract W-7405-ENG-48. *Journal of the American Chemical Society ;* **103**: No. 12, 3578-3579(17 Jun 1981).

This paper demonstrates a novel method for recording high-resolution spectra which, for a coupled spin system, gives transitions at the same frequencies and resolution as would be seen with an absolutely homogeneous field. The method uses multiple quantum coherence transfer echoes. Acetaldehyde partially oriented in a nematic liquid crystal is used as an example to show how inhomogeneous broadening is removed. Pulse sequences for total spin coherence transfer echo spectroscopy are discussed. (DLC)

27448 Preparation of polar glass capillary columns. Higgins, C.E. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Analytical Chemistry ;* **53**: No. 4, 732-734(Apr 1981).

The use of ether as the solvent for the stationary phase in the preparation of wall-coated capillary columns significantly reduced the time required for column preparation. Evaporation proceeded rapidly and smoothly, with no internal disruption of the liquid column as long as the bath temperature was sufficiently subambient. At 19°C, columns over 60 m in length were coated in only 2 days, but columns of the same length prepared from methylene chloride solutions required between 1 to 2 weeks at ambient temperature. Methylene chloride solutions can be evaporated quickly at elevated temperatures, but beading up of the UCON film may occur. Reproducibility of gas chromatographic behavior was demonstrated. Three separate columns were tested by thermal-desorption gas chromatographic analysis of air pollutants trapped on Tenax. This figure was obtained by using polypropylene glycols, UCON 50 HB 660 columns, but UCON 50 HB 2000 gave practically the same profile. The chromatographic profiles were virtually identical, and the reproducible behavior of the columns was apparent. By this rapid method of preparing reproducibly behaving columns, the analyst can easily prepare reserve columns or quickly replace worn out columns with ones having almost identical separation characteristics.

27449 Deposition method for moving ribbon liquid chromatograph-mass spectrometer interfaces. Smith, R.D.; Johnson, A.L. (Pacific Northwest Lab., Richland, WA). Contract AC06-76RL01830. *Analytical Chemistry ;* **53**: No. 4, 739-740(Apr 1981).

The improved aerosol liquid deposition device developed for liquid chromatographs (LC) and mass spectrometers (MS) interface constructed at Pacific Northwest Laboratory can handle enhanced solvent flows. Besides this, analyses using the PNL LC-MS system have demonstrated improved peak shapes and transfer efficiencies for the more volatile compounds. These advantages are a direct result of the deposition method which results in very rapid evaporation without direct heating of the ribbon. Since this system is not equipped with a solids inlet probe, an absolute measure of transfer efficiency is not possible; however, significant improvements in the transfer of volatile compounds have been noted. Compounds with

boiling points of approximately less than 180°C, which are difficult to detect with conventional deposition-evaporation techniques, are readily observed by using aerosol deposition. The aerosol deposition method for moving ribbon LC-MS interfaces is clearly superior to existing practice. The method can be easily and inexpensively added to existing moving ribbon interfaces and results in improved liquid evaporation, LC-MS peak shapes, and transfer efficiency.

27450 Characterization of carbonaceous materials using extraction with supercritical pentane. Fetzer, J.C.; Graham, J.A.; Arrendale, R.F.; Klee, M.S.; Rogers, L.B. (Univ. of Georgia, Athens). Contract AS09-76ER00854. *Separation Science and Technology ;* **16**: No. 1, 97-111(Feb 1981).

The use of carbonaceous adsorbents is limited by irreversible adsorption of some compounds, so the use of supercritical pentane as an extracting solvent was examined. Carbon black appeared to be broken down slowly, but continuously, by the pentane. To see if other types of carbon behaved similarly, high purity graphite, technical grade graphites, active carbons, and charcoals were examined. The extracts were characterized by uv spectroscopy, packed column chromatography using flame ionization and flame photometric detectors and capillary GC/MS. The extracts were characteristic for each class of carbonaceous material. The high purity graphite yielded large, polycyclic aromatic compounds; the technical grade graphites yielded alkanes and alkyl-substituted benzenes and naphthalenes; the active carbons yielded alkanes, dienes, and small amounts of alkyl-substituted benzenes; and the charcoals yielded almost entirely alkanes in small amounts.

27451 Multi-temperature gas chromatography using isothermal columns in series. Spencer, W.A.; Rogers, L.B. (Univ. of Georgia, Athens). Contract AS09-76ER00854. *Chemical, Biomedical, and Environmental Instrumentation ;* **11**: No. 1, 1-25(1981).

A computer-controlled three-oven gas chromatograph having a multi-position stream-switching valve has been used first to divide a wide-boiling mixture of n-alkanes into three cuts and then to fractionate each cut using a packed column at a different temperature. After initial injection of the sample into the highest temperature column, the low boilers were switched to a low-temperature oven. Then, the mid-boilers were switched to a column at an intermediate temperature. For routine repetitive analyses, the multi-oven approach offers an attractive alternative. 8 figures.

27452 Applications of ion-selective electrodes in organic microanalysis: potentiometric determination of organic cations precipitated by tetraphenylborate. Selig, W. (Lawrence Livermore National Lab., CA). *Mikrochimica Acta ;* **2**: 133-144(1980).

Sodium tetraphenylborate has been used in the potentiometric precipitation titration of various water-soluble organic cations, mostly containing a quaternary ammonium moiety. Emf's were monitored with a fluoroborate ion-selective indicator electrode and a double-junction reference electrode. The perchlorate and nitrate electrodes also respond to the various cations. The solid-state cyanide electrode responds to most of the cations investigated. This makes it possible to carry out titrations in partially nonaqueous media. Some of the compounds which can be determined are alkaloids, dyes, and other organic bases. 2 figures, 4 tables.

27453 (UCRL-Trans—11668) Determination of glutamic acid, aspartic acid, and aminoacetic acid by potentiometric titration using a Cu^{2+}-sensitive electrode. Haiduc, I.; Mioscu, M.; Cormos, D. Translated from *Studia Universitatis Babes-Bolyai, [Series] Chemia ;* **24**: No. 2, 59-62(1979). 8p. NTIS, PC A02/MF A01.

This paper presents a volumetric determination of amino acids by potentiometric titration with $CuSO_4$ solution using PbS single-crystal electrode sensitve to Cu^{2+} ions to indicate the endpoint. Analysis results for glutamic acid, aspartic acid and aminoacetic acid are presented. The experimental data show that this method can be applied to quantities of the order of a milligram with an error of 0.2 to 5%.

27454 Analysis of organic pollutants by synchronous luminescence spectrometry. Vo-Dinh, T.; Gammage, R.B.; Hawthorne, A.R. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. pp 111-119 of Polynuclear aromatic hydrocarbons. Jones, P.W.; Leber, P. (eds.). Ann Arbor, MI; Ann Arbor Science Publishers, Inc. (1979).

From 3. international symposium on chemistry and biology: carcinogenesis and mutagenesis; Ann Arbor, MI, USA (1979).

Synchronous luminescence spectroscopy has a great potential as a rapid, easy-to-use, and cost-effective tool for analyzing large numbers of unfractionated or coarsely fractionated environmental samples. It should improve the effectiveness of analysis in the initial stages of screening organic pollutants in samples originating from coal-energy technologies, such as samples taken from process streams or collected as fugitive emissions. 4 figures, 1 table.

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REFER ALSO TO CITATION(S) 26925, 27069, 27203, 27409, 27450, 27499, 27509, 27513, 27520, 27860

27455 (BNL—29634) Stability studies of the chlorine containing phase at the SiO_2/Si interface produced by HCl/O_2 oxidation of silicon. Butler, S.R.; Feigl, F.J.; Titcomb, S.L.; Tsai, H.; Jones, K.H.; Kraner, H.W. (Brookhaven National Lab., Upton, NY (USA); Lehigh Univ., Bethlehem, PA (USA). Sherman Fairchild Lab.). 1980. Contract AC02-76CH00016. 9p. (CONF-8007108—1). NTIS, PC A02/MF A01. Order Number DE81025082.

From Topical conference on thermally grown oxides on silicon; Berkeley, CA, USA (28 Jul 1980).

SiO_2/Si samples prepared in 2% and 4% HCl/O_2 mixtures at 1200°C have been annealed in H_2O/N_2 ambients at 1200°C. The anneals ranged up to 16 hrs in ambients with 4 or 40 ppM H_2O in N_2. Rutherford backscattering measurements have been made to determine the amount and location of Cl incorporated in these samples. A linear loss of Cl with annealing time is found for all samples. Changes in the distribution of Cl near the SiO_2/Si interface are found. These changes are interpreted in terms of morphological changes in the third (Cl containing) phase. A significant effect of the H_2O content of the N_2 ambient is observed.

27456 (CONF-801055—, pp 193-196) Optical constants of single crystals IrO_2 and RuO_2 and their relation to electronic structure. Goel, A.; Skorinko, G.; Pollak, F.H. (Brookyln College, NY). Mar 1981. NTIS, PC A16/MF A01.

From 5. annual thermal storage meeting; McLean, VA, USA (10 Oct 1980).

A novel design for water electrolysis using a solid polymer electrolyte is being developed by General Electric. Ruthenium is one of the best electrocatalysts for the oxygen evolution reaction. There are problems connected with the significant loss in electrocatalytic activity with time. This performance degradation is presumably due to the gradual formation of an RuO_2 film. In addition to investigation of variations of catalytic activity, the intrinsic reflectivity of RuO_2 and IrO_2 is of considerable interest. Measurements of the spectral dependence are extremely valuable in elucidating the electronic properties. Results of reflectivity measurements of single crystals are compared with the band structure calculations of Mattheiss and thus give valuable information concerning the nature of the d-electrons in these materials.

27457 (CONF-810693—1(Draft)) Study of nitric oxide adsorption on copper (100) and (110). Wendelken, J.F. (Oak Ridge National Lab., TN (USA)). Jun 1981. Contract W-7405-ENG-26. 22p. NTIS, PC A02/MF A01. Order Number DE81024133.

From International conference on solid films and surfaces; College Park, MD, USA (8 Jun 1981).

Electron energy loss vibrational spectroscopy, low energy electron diffraction and thermal desorption spectroscopy were used. In the case of Cu(110), vibrational spectra confirm that molecular adsorption of NO occurs for very low exposures at 80°K. For exposures exceeding 2.2 Langmuirs, dissociation occurs with atomic oxygen and nitrogen retained on the surface and located at the long bridge site. Vibrational frequencies obtained using two iso-

topic forms of NO, ^{14}NO and ^{15}NO, are assigned to the stretching and bending modes of NO and indicate a molecule strongly tilted relative to the surface normal in a predissociative state. Dissociation occurs at temperatures above 113°K with the atomic species again retained on the surface. Adsorption of nitric oxide on Cu(100) was found to be more complicated. Vibrational spectra indicate a difference in molecular species between low exposure (1 Langmuir) and high exposure (10 Langmuir) cases below 100°K. Depending on exposure and temperature, evidence is found for the presence of N_2O, two forms of NO, O, and probably N_2. A large fraction of the NO dissociates upon initial adsorption on Cu(100). All species containing nitrogen are found to desorb or dissociate below room temperature. 3 figures.

27458 **(DOE/ER/04496—T1) Surface characterization of catalytically active metal, alloy, and compound films. Progress report, January 1, 1981-December 31, 1981.** Vook, R.W. (Syracuse Univ., NY (USA)). Jun 1981. Contract AS02-77ER04496. 16p. (COO—4496-4). NTIS, PC A02/MF A01. Order Number DE81025550.

The work consists primarily of verification and confirmation of the Auger electron spectroscopy R-factor effect. The R-factor is a very sensitive measure of doublet Auger line shape changes or relative doublet line shifts. It can be used to identify epitaxial growth (in contrast to polycrystalline growth) and layer growth (in contrast to island or three dimensional growth). In these cases the R-factor oscillates periodically with added film thickness, for both thin and thick (≥ 1500 A) films. The period equals the layer thickness. Since maxima in R are associated with a smooth surface and minima with a maximum in step density, R gives a measure of surface topography. An effect due to the substrate induced misfit strains on the Auger R-factor has been established. Studies were carried out on (111)Pd/(111)Cu, (111)Ag/(111)Cu, (111)Cu, and (111)Ag surfaces to establish the general validity of the results initially obtained with Pd. Experiments were begun to determine the effect of steps (as characterized by the R-factor) on the chemisorption of oxygen on Pd.

27459 **(UCID—18925) Development of a potassium hydrogen phosphate adhesive for use in KDP laser arrays.** Shell, P.K. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 15 Dec 1980. Contract W-7405-ENG-48. 7p. NTIS, PC A02/MF A01. Order Number DE81025917.

Although phosphate polymerization and glass formation have received considerable attention, very little work has been reported on the dehydration of the more acidic, amorphous alkali phosphates. These phosphate materials are potential candidates for use as an optical adhesive in preparing the KDP-glass arrays for use as harmonic generators in Nova and other advanced laser systems. The adhesive nature of the $KH_5(PO_4)_2$-based materials that were dehydrated enough to remove the crystal-forming phase was tested in two types of qualitative experiments. In both tests the phosphate-based adhesive formed a remarkably strong bond with striking clarity and very good refractive-index matching. However, minute traces of water introduced during handling and exposure to the air caused crystallites to form in the adhesive within minutes. By the next day the bond was still strong, but the adhesive contained very large, opaque crystals. A repeat glass-sandwich test of $KH_5(PO_4)_2$-based material that was even more dehydrated gave the same disappointing results. Although the crystallization observed in both phosphate adhesvies makes this material unacceptable as an optical adhesive, much can be done to improve the characteristics of this adhesive. Recommendations are presented. (DMC)

27460 **Tests of collinear quasiclassical trajectory transmission coefficient correction to transition state theory.** Bowman, J.M.; Ju, G.; Lee, K.T.; Wagner, A.F.; Schatz, G.C. (Department of Chemistry, Illinois Institute of Technology, Chicago, Illinois 60616). *Journal of Chemical Physics ;* **75**: No. 1, 141-147(1 Jul 1981).

We test the accuracy of a collinear quasiclassical trajectory transmission coefficient correction to conventional transition state theory. Comparisons are made between the so-modified transition state theory, conventional transition state theory, and previously reported three dimensional quasiclassical trajectory rate constants for several reactions. They are the $O(^3P)+H_2(v = 0)$, $H_2(v = 1)$ reactions on three different potential energy surfaces, the $F+H_2(v = 0)$ reaction on the LEPS surface of Muckerman (no. 5), and the $H+H_2(v = 0)$ reaction on the Porter—Karplus surface. Although each of these systems has a collinear transition state, they span a wide variation in saddle point location and classical barrier height. We find that the collinear quasiclassical trajectory transmission coefficient very successfully corrects the conventional transition state rate constant even for the $O(^3P)+H_2(v = 1)$ reaction where the latter differs from the 3D quasiclassical one by two orders of magnitude.

27461 **Oxidation by aqueous fluoroxysulfate: catalysis by silver(I).** Thompson, R.C. (Univ. of Missouri, Columbia); Appelman, E.H. *Inorganic Chemistry ;* **20**: No. 7, 2114-2118(Jul 1981).

The oxidations of the ions Cr^{3+}, CO^{2+}, and VO^{2+} by the fluoroxysulfate ion, SO_4F^-, in aqueous solution are catalyzed by Ag^+. The rate-determining step for all three catalyzed reactions is the bimolecular oxidation of Ag^+ by SO_4F^-, which has a rate constant of (1.3 +- 0.2) x 10^3 M^{-1} s^{-1} at 17°C. Activation parameters for this reaction are ΔH^{++} = 6.1 +- 0.5 kcal/mol and ΔS = -23 +- 2 cal/(mol deg). In the absence of Ag^+, Co^{2+}, and VO^{2+} react very slowly with SO_4F^-, while Cr^{3+} does not react at all. Despite its high thermodynamic oxidizing power, the fluoroxysulfate ion acts as a very selective oxidant.

27462 **Hydrolytic polymerization of chromium(III). I. Two dimeric species.** Thompson, M.; Connick, R.E. (Univ. of California, Berkeley). Contract W-7405-ENG-48. *Inorganic Chemistry ;* **20**: No. 7, 2279-2285(Jul 1981).

In addition to the well-known doubly bridged chromium(III) dimer $[(H_2O)_4Cr(OH)_2Cr(H_2O)_4]^{4+}$, a second dimer of formula $[(H_2O)_5CrOHCr(H_2O)_5]^{5+}$ has been found. The formula of the latter was established through equilibrium measurements and freezing point depression. The equilibrium between Cr^{3+} and the doubly bridged dimer was measured at various ionic strengths and temperatures. The equilibrium between the doubly bridged and singly bridged dimers is shifted strongly toward the latter only at high acidities, with roughly equal concentrations at 2 M acid. Electron spin resonance spectra were taken for both dimers in order to obtain g values. The latter were used with magnetic susceptibility measurements to calculate the spin-spin coupling constants between the two chromiums of these species. Comparison is made with the coupling constants of other bridged chromium(III) compounds, and the results are shown to be in reasonable agreement. The striking difference in magnetic susceptibility between the doubly bridged chromium dimer and the iron(III) dimer of empirical formula $Fe_2(OH)_2^{4+}$ is discussed in terms of possible structures and electronic interactions.

27463 **Principal components of the cadmium-113 shielding tensors in cadmium sulfate hydrates: nuclear magnetic resonance study of cadmium coordinated with oxygen.** Murphy, P.D.; Gerstein, B.C. (Iowa State Univ., Ames). Contract W-7405-ENG-82. *Journal of the American Chemical Society ;* **103**: No. 12, 3282-3286(17 Jun 1981).

A study is reported of the principal components of the ^{113}Cd NMR shielding tensors in the salts $3CdSO_4.8H_2O$ and $CdSO_4.H_2O$. A discussion of the sensitivity of the principal components of the ^{113}Cd shielding tensors to coordination of the cadmium with nearest-neighbor oxygens is presented. An apparent anomaly between the observed shielding anisotropies and the proposed Cd-O bonding distances for $3CdSO_4.8H_2O$ has prompted a refinement of the original crystal structure proposed by Lipson. The refined Cd-O bonding distances are found to be more uniform than those originally reported, in agreement with information inferred from the observed ^{113}Cd NMR shielding anisotropies.

27464 **Electron spin echo studies of solvation structure.** Kevan, L. (Univ. of Houston, TX). *Journal of Physical Chemistry ;* **85**: No. 12, 1628-1636(11 Jun 1981).

The development and application of electron spin echo modulation analysis for deducing detailed geometrical information about the solvation shell structure of paramagnetic species is described. This technique makes it possible to measure weaker hyperfine interactions in disordered systems such as fro[illegible]n solutions and surfaces

than is normally possible. The number, distance, and orientation of first solvation shell molecules can then be determined. Applications of this technique to silver atom solvation, electron solvation, anion solvation, cation solvation, and cation solvation on surfaces are described.

27465 X-ray photoelectron spectroscopic study of organometallic nitrosyl compounds of chromium, molybdenum, and tungsten. Chen, H.W. (Lawrence Berkeley Lab., CA); Jolly, W.L.; Xiang, S.F.; Legzdins, P. W-7405-ENG-48. *Inorganic Chemistry ;* **20**: No. 6, 1779-1782(Jun 1981).

Gas-phase core electron binding energies of organometallic nitrosyl complexes of chromium, molybdenum, and tungsten are reported. On going from Cr to W in the series $CpM(NO)_2Cl$ (M = Cr, Mo, W), back-bonding to the NO groups increases and electron density is withdrawn from the Cl atoms. The data for $CpM(NO)_2Cl$ and $CpM(CO)_2NO$ (M = Cr, Mo, W) indicate that the back-bonding in the Mo and W compounds is significantly different from that in first-row transition-metal nitrosyls. Electron density is mainly transferred to the nitrosyl oxygen atom, whereas, in first-row nitrosyls, approximately equal amounts of electron density are transferred to the oxygen and nitrogen atoms.

27466 Synthesis and spectral characterization of fac- and mer-[N-(Carboxymethyl)-L-β-(2-pyridyl)-α-alaninato](D-threoninato)cobalt(III), [Co(N-Cm-L-Pyala)(D-Thr)], and the molecular structure of the mer isomer. Meiske, L.A.; Jacobson, R.A.; Angelici, R.J. (Iowa State Univ., Ames). *Inorganic Chemistry ;* **20**: No. 6, 1794-1801(Jun 1981).

Oxidation of Co(II) to Co(III) in the presence of N-(carboxymethyl)-L-β-(2-pyridyl)-α-alaninate (N-Cm-L-$Pyala^{2-}$) and D-threoninate (D-Thr^-) produced two isomers of the complex [Co(N-Cm-L-Pyala)(D-Thr)] which were easily separated on acidic alumina. On the basis of their visible spectra, one isomer was assigned a structure in which the nitrogen atoms are arranged meridionally around the cobalt, while the other was assigned to the only possible facial isomer. Of the three possible meridional isomers, the one isolated was assigned a structure in which the amino nitrogen of the D-Thr^- ligand is coordinated trans to the pyridyl nitrogen of the N-Cm-L-$Pyala^2$-ligand. This assignment was based on the presence of a shoulder on the low-wavelength side of the 537-nm absorption observed in its visible spectrum. This geometry was confirmed by a three-dimensional x-ray analysis of mer-[Co(N-Cm-L-Pyala)(D-Thr)].1/2 H_2O. The compound crystallizes in the monoclinic space group $P2_1$ with a = 10.350 (4) A, b = 10.339 (4) A, c = 15.340 (6) A, β = 92.98 (5)°, and Z = 4. The structure was solved by the heavy-atom method and refined initially by block-matrix least-squares and finally by full-matrix least-squares procedures to a final weighted R factor of 0.084. In addition to the crystal structure of mer-[Co(N-Cm-L-Pyala)(D-Thr)].1/2 H_2O, the ^1H NMR, visible, and CD spectra of both the mer- and fac-[Co(N-Cm-L-Pyala)(D-Thr)] isomers are discussed.

27467 Structural studies of precursor and partially oxidized conducting complexes. 21. Single-crystal and powder time-of-flight neutron diffraction studies of $Tl_4[Pt(CN)_4]CO_3$. Beno, M.A.; Rotella, F.J.; Jorgensen, J.D.; Williams, J.M. (Argonne National Lab., IL). *Inorganic Chemistry ;* **20**: No. 6, 1802-1806(Jun 1981).

The crystal and molecular structure of the unusual complex $Tl_4[Pt(CN)_4]CO_3$, obtained by mixing $Tl_2[Pt(CN)_4]$ and Tl_2CO_3 in aqueous solution at 95°C, was determined by both single-crystal and time-of-flight powder neutron diffraction. The complex is not a partially oxidized tetracyanoplatinate (POTCP) salt and contains Pt in an integral (2.0) oxidation state. The lustrous metallic green complex crystallizes in the tetragonal space group, with unit cell constants a = b = 9.911 (4) A (9.908 (3) A, powder study), c = 6.490 (3) A (6.487 (2) A), and V/sub c/ = 637.5 A^3 at 298°K. In the single-crystal study diffracted intensities of 267 independent reflections were measured to a (sin θ)/λ limit of 0.438 A^{-1}, and of these 202 had $F_o^2 >$ sigma(F_o^2). Full-matrix least-squares refinement of all structural parameters resulted in a final $R(F_o^2)$ = 0.075 (all data) and $R(F_o^2)$ = 0.068. It is important to note that the structural parameters derived with use of the time-of-flight neutron diffraction and single-crystal methods are, in this case, virtually identical. The most pertinent structural feature in $Tl_4[Pt(CN)_4]CO_3$ is that the Pt atoms form perfectly linear chains with Pt-Pt separations crystallographically constrained to a value of (c/2) = 3.245 (3) A. The intrachain Pt-Pt separation is much longer than in the partially oxidized salts (2.80 to 2.96 A) and accounts for the low electrical conductivity in this salt. The structure is composed of square-planar $Pt(CN)_4^{2-}$ groups linked by Tl^+ cations, all of whichoccupy the same molecular plane, and carbonate groups which lie between the $Pt(CN)_4^{2-}$ groups. The CO_3^{2-} group oxygen atoms are clearly disordered among at least two positions, creating six partially occupied oxygen atom sites per group. The Tl^+ and O separations are ~ 0.2 A shorter than the sum of the ionic radii which is probably an artifact of disorder.

27468 Crystal structure of $[HRh[P(O\text{-}i\text{-}C_3H_7)_3]_2]_2$: a neutron diffraction study. Teller, R.G. (Brookhaven National Lab., Upton, NY); Williams, J.M.; Koetzle, T.F.; Burch, R.R.; Gavin, R.M.; Muetterties, E.L. *Inorganic Chemistry ;* **20**: No. 6, 1806-1811(Jun 1981).

A neutron diffraction study of $[HRh[P(O\text{-}i\text{-}C_3H_7)_3]_2]_2$ confirmed the square-planar coordination geometry inferred from spectroscopic data and accurately placed the hydride ligands at bridging positions. At 112.4°K, the crystal lattice was triclinic, of space group P anti 1, with a = 12.084 (3) A, b = 13.505 (6) A, c = 9.540 (2) A, α = 97.49 (2)°, β = 105.18 (1)°, γ = 116.15 (2)°, V/sub c/ = 1074.4 A^3, and Z = 1. The Rh-Rh distances were 2.65 (1) A, and the Rh-H distances were 1.808 (14) A with H-Rh-H and Rh-H-Rh angles of 85.9 (5) and 94.1 (4)°, respectively. With an only slightly expanded P-Rh-P angle of 94.7 (4)°, near 90° average H-Rh-P angles, and near coplanarity of the $H_2Rh_2P_4$ system, the square-planar coordination geometry about each rhodium atom was established unequivocally. The planar Rh_2H_2 system is rectangular with 2.65- and 2.46-A diagonals. Two four-center (Rh_2H_2) two-electron bonds are responsible for the framework bonding in the diameter. The net Mulliken bond order for the direct Rh-Rh interaction is positive but very small whereas those for Rh-H are large, nearly 0.5, as indicated by a molecular orbital analysis.

27469 Proton transfers in hydrogen-bonded systems. 2. Electron correlation effects in $(N_2H_7)^+$. Scheiner, S.; Harding, L.B. (Southern Illinois Univ., Carbondale). Contract W-31-109-ENG-38. *Journal of the American Chemical Society ;* **103**: No. 9, 2169-2173(6 May 1981).

Potentials for transfer of the central proton between the NH_3 units of $(H_3NHNH_3)^+$ are calculated via ab initio methods ar several levels of sophistication. Double-well potentials are obtained for all internitrogen distances studied which vary between 2.73 and 3.15 A. All methods indicate that the energy barrier to proton transfer increases as the two NH_3 molecules are further removed from one another. Treatment of electron correlation via the polarization configuration interaction (POL-CI) method leads to barriers substantially smaller than those obtained by restricted Hartree-Fock calculations with use of a basis set of double zeta plus polarization function (RHF/DZP) quality. Inclusion of only intrapair correlations involving the two nitrogen lone pairs with use of the generalized valence bond (GVB) method leads to no decreases in the barriers relative to the DZP Hartree-Fock estimates. Use of the smaller split valence 4-31G basis produces barriers intermediate between the RHF/DZP and POL-CI results. Proton transfers in $(N_2H_7)^+$ in the gas phase are studied using both a rigid model and one which includes relaxation of the R(NN) distance during proton motion. The latter relaxation results in a lowering of the POL-CI barrier from 3.5 to 1.5 kcal/mol. 2 figures, 4 tables.

27470 Theoretical challenge to the experimentally determined geometrical structure of dimethylsilaethylene. Yoshioka, Y.; Goddard, J.D.; Schaefer, H.F. III. (Univ. of Texas, Austin). *Journal of the American Chemical Society ;* **103**: No. 9, 2452-2453(6 May 1981).

Possible causes of the discrepancy between the experimental value for the Si=C double bond and theory are discussed. It is suggested that the Si=C bond distance for the unsubstituted silaethylene is 1.705 +- 0.03 A. (DLC)

27471 Correlation of metal-metal bonding in halides and chalcides of the early transition elements with that in the metals. Corbett, J.D. (Iowa State Univ., Ames). Contract W-7405-ENG-82. *Journal of Solid State Chemistry ;* **37**: No. 3, 335-351(May 1981).

Values of the average Pauling metal-metal bond order n per metal valence electron (PBO/e) are reported for about 110 metal-rich compounds of transition groups III-VI (including the lanthanides) which are structurally well characterized. The calculations include bond orders over all metal-metal separations with n > ~ 0.07 and assume only the presence of closed-shell anions, the Pauling equation D/sub n/ = D_1 - 0.60 log n, and D_1 values likewise calculated from the respective metals. Matrix effects-usually anion-anion repulsions that restrict metal-metal bonding-are shown to yield plausible and predictable reductions in PBO/e values, these effects being greater with high nonmetal:metal ratios, large anion or small metallic radii, in M_6X_{12}-type clusters, and in layered and rock-salt-type structures. On the other hand, 32 metal-rich halides and chalcides are found to be relatively free of matrix effects and to be strongly metal-metal bonded relative to their respective metals by the criterion 0.80 ≦ PBO/e < 1.05, these being principally M_6X_8-type clusters and extended (condensed) metal networks. Three special circumstances are considered: reduced metal-metal bonding in the molybdenum chalcides (but not halides), which arises from strong heteroatom bonding and nonmetal repulsions between clusters; a few errant examples with low concentrations of metallic electrons in which core sizes dictate separations (e.g., Ca^2N, PBO/e = 22.4); and some clusters of Nb, Mo, and W containing only oxide and fluoride in which nonmetal π contributions evidently give effective bond orders > 1.0. 4 tables.

27472 Some reduced ternary and quaternary oxides of molybdenum. A family of compounds with strong metal-metal bonds. Torardi, C.C.; McCarley, R.E. (Iowa State Univ., Ames). Contract W-7405-ENG-82. *Journal of Solid State Chemistry ;* **37**: No. 3, 393-397(May 1981).

Several new, reduced ternary and quaternary oxides of molybdenum are reported, each containing molybdenum in an average oxidation state < 4.0. All are prepared by reactions between a molybdate salt; metal oxide, if needed; and MoO_2 sealed in Mo tubes held at 1100°C for ca. 7 days. Refinement of the substructure of the new compound $Ba_{0.62}Mo_4O_6$ was based on an orthorhombic cells, with a = 9.509(2), b = 9.825(2), c = 2.853(1) A, Z = 2 in space group Pbam; weak supercell reflections indicate the true structure has c = 8(2.853) A. The chief structural feature is closely related to that of $NaMo_4O_8$ which consists of infinite chains of Mo_6 octahedral clusters fused on opposite edges, bridged on the outer edges by O atoms and crosslinked by Mo-O-Mo bonding to create four-sided tunnels in which the Ba^{2+} ions are located. The structure of $Ba_{1.13}Mo_8O_{16}$ is triclinic, a = 7.311(1), b = 7.453(1), c = 5.726(1) A, α = 101.49(2), β = 99.60(2), γ = 89.31(2)°, Z = 1, space group P1. It is a low-symmetry, metal-metal bonded variant of the hollandite structure, in which two different infinite chains, built up from $Mo_4O_8^{2-}$ and $Mo_4O_8^{0}$ $^{26-}$ cluster units, respectively, are interlinked via Mo-O-Mo bridge bonding to create again four-sided tunnels in which the Ba^{2+} ions reside. Other compounds prepared and characterized by analyses and x-ray powder diffraction data are Pb/sub x/ Mo_4O_6 (x ~ 0.6), $LiZn_2Mo_3O_8$, , $CaMo_5O_8$, $K_2Mo_{12}O_{19}$, and $Na_2Mo_{12}O_{19}$.

27473 Dynamical calculation of the temperature dependence of the activation energy for a chemical reaction from 444 to 2400 K. Blais, N.C. (Los Alamos Scientific Lab., NM); Truhlar, D.G.; Garrett, B.C. *Journal of Physical Chemistry ;* **85**: No. 9, 1094-1096(30 Apr 1981).

The quasiclassical trajectory method with Monte Carlo and importance sampling and with the Tolman interpretation of the activation energy has been used to calculate the activation energy for a bimolecular reaction at three temperatures in the range 444 to 2400 K. The activation energy is found to increase by 6 kcal/mol over this range.

27474 Reaction of fluoroxysulfate with aromatic compounds. Ip, D.P.; Arthur, C.D.; Winans, R.E.; Appelman, E.H. (Argonne National Lab., IL). *Journal of the American Chemical Society ;* **103**: No. 8, 1964-1968(22 Apr 1981).

The fluoroxysulfate ion, SO_4F^-, substitutes fluorine on aromatic compounds in acetonitrile solution at room temperature. However, benzyl fluoride is the principal product from toluene. Other products are also formed, particularly in the case of the less reactive aromatic substrates. Product distributions and relative reactivities are interpreted in terms of an initial electrophilic attack that can be followed by free-radical side reactions.

27475 Reactions of (alkylperoxy)cobaloximes in acidic aqueous solutions. Espenson, J.H.; Chen, J.T. (Iowa State Univ., Ames). Contract W-7405-ENG-82. *Journal of the American Chemical Society ;* **103**: No. 8, 2036-2041(22 Apr 1981).

Bis(dimethylglyoximato)cobalt(III) complexes containing coordinated alkylperoxy groups have been studied. The compounds examined are (1) $ROOCo(dmgH)_2$(pyridine) complexes with R = isopropyl, 2-butyl, cyclopentyl, benzyl, and isopropyl-d_7 and (2) $(CH_3)_2CHOOCo(dmgH)_2L$ complexes with L = pyridine, piperidine, water, and ammonia. The complexes react wtih aqueous perchloric acid to form the cobalt(III) product $(H_2O)Co(dmgH)_2L^+$ and a mixture of ketone and hydroperoxide. The organic products are formed in parallel pathways, each by a kinetic equation having the same algebraic form, and are the products of respective oxygen-oxygen and cobalt-oxygen bond cleavage reactions. Kinetic data were determined as a function of $[H^+]$ and, in the case of the 2-butyl complex, temperature. The rate constants for reactant disappearance and of product formation were determined, as was the ratio of ketone to hydroperoxide in the products. An important preequilibrium is the protonation of the oxime oxygens; the equilibrium constant varies in a way which reflects the basicity of the axial ligand L. The kinetic data and other results can be used to formulate a separate pathway leading to each product. Hydroperoxide formation is best accounted for by a pathway in which internal proton transfer from H^+ bound to oxime oxygen occurs. Ketone production, on the other hand, shows an appreciable kinetic isotope effect: k/sup H//k/sup D/ = 8.9 +- 1.5, suggesting C-H bond breaking is a major part of the activation process.

27476 Synthesis and spectroscopic study of eta^5-$C_5H_5(CO)_2Fe[C(XR)YR]^+$ carbene complexes, where X and Y are O, S, Se, and/or NR. McCormick, F.B.; Angelici, R.J. Contract W-7405-ENG-82. *Inorganic Chemistry ;* **20**: No. 4, 1111-1117(Apr 1981).

The synthesis of various iron carbene complexes incorporating O, S, and Se into the carbene ligands is described. These complexes and others previously reported were analyzed by means of IR, ^1H NMR and ^{13}C NMR spectroscopy with emphasis on the relative π-stabilization abilities of the heteroatoms in the carbene ligand. The order of the relative π-stabilization ability was determined to be N >> Se ≧ S > O. Data are also reported to further confirm the sensitivity of these carbenes to changes in electronic environment. (BLM)

27477 Reactions of eta^5-$C_5H_5(CO)_2Fe[C(XR)YR]^+$ carbene complexes, where X and Y are O, S, Se, and/or NR, with amines. McCormick, F.B.; Angelici, R.J. Contract W-7405-ENG-82. *Inorganic Chemistry ;* **20**: No. 4, 1118-1123(Apr 1981).

Reactions of $Cp(CO)_2Fe[C(XR)YR]^+$ where Cp = eta^5-C_5H_5 with amines occur at the carbene ligand when X, Y = O, S, and/or Se and the product distribution is dependent upon the leaving-group abilities of the carbene substituents ($PhSe^-$ ≃ PhS^-, PhO^- > CH_3S^- > CH_3O). When both carbene substituents are good leaving groups ($PhSe^-$, PhS^-, PhO^-, or CH_3S^-), $Cp(CO)_2Fe[C(XR)YR]^+$ reacts with primary amines to give isocyanide complexes, $Cp(CO)_2FeCNR^+$, and with secondary amines to form carbene derivatives, $Cp(CO)_2Fe[C(XR)NR_2]^+$. When only one carbene substituent is a good leaving group, $Cp(CO)_2Fe[C(XR)YR]^+$ yields carbene derivatives, $Cp(CO)_2Fe^+[C(XR)NRR']^+$ (XR = OCH_3; R' = R, H), upon reaction with primary or secondary amines. Substituents are poor leaving groups (CH_3O^-), a complex mixture of products generally results on reaction with amines. A mechanism involving formation of an ylide intermediate, $Cp(CO)_2Fe[C(XR)(YR)NR_3]^+$, is proposed to account for these results. Spectroscopic studies (ir and ^{13}C NMR) show that N → C (carbene) π donation increases as the basicity of

the amine group increases for the $Cp(CO)_2Fe[C(OCH_3)NR_2]^+$ complexes.

27478 Synthesis and characterization of oxopentakis(isothiocyanato)metalate(V) complexes of rhenium and technetium. Davison, A.; Jones, A.G.; Mueller, L.; Tatz, R.; Trop, H.S. *Inorganic Chemistry ;* **20**: No. 4, 1160-1163(Apr 1981).

The reduction of perrhenate with thiocyanate ion has been shown to produce $ReO(NCS)_5^{2-}$ and $Re(NCS)_6^{2-}$. The rhenium(V) complex, $ReO(NCS)_5^{2-}$, can be prepared from $[ReOBr_4\ CH_3CN]^-$ or $ReOCl_5^{2-}$ by ligand substitution. The analogous technetium complex, $TcO(NCS)_5^{2-}$, has been prepared by ligand substitution on $TcOCl_4^-$. Physical data for these complexes are presented, and their involvement in the reduction of MO_4^- (M = Re, Te) with thiocyanate ion is discussed.

27479 Metal-metal repulsion and bonding in confacial bioctahedra. Crystal structures of $Cs_3Y_2I_9$ and $Cs_3Zr_2I_9$ and comparison with related phases. Guthrie, D.H.; Meyer, G.; Corbett, J.D. Contract W-7405-ENG-82. *Inorganic Chemistry ;* **20**: No. 4, 1192-1196(Apr 1981).

The title compounds were synthesized by reaction of CsI_3 and Y or CsI, Zr, and ZrI_4 at 750 to 850°C in welded Ta containers. Both were shown to have the $Cs_3Cr_2Cl_9$-type structure, space group $P6_3/mmc$. Positional and thermal parameters were established by full-matrix least-squares refinement of single-crystal diffractometer data. Data for the structures and the refinements of $Cs_3Y_2I_9$ and $Cs_3Zr_2I_9$ are respectively a = 8.406 (1) and 8.269 (1) A, c = 21.280 (5) and 19.908 (3) A, R = 0.050 and 0.082, and R/sub w/ = 0.082 and 0.077 for 328 and 610 independent reflections with $2\theta \leq 50$ and 60° collected with Mo Kα radiation. The transition from the yttrium to the zirconium compound is accompanied by a decrease of the metal-metal distance in the $M_2I_9^{3-}$ confacial bioctahedra from 4.052 (9) to 3.129 (4) A owing to the formation of a Zr-Zr bond. Correspondingly large changes occur in the internal angles in the M-I-M bridges. Parameters of five M_2X_9 groups in the $Cs_3Cr_2Cl_9$-type structure and of $CsCdCl_3$, all of which lack M-M bonds, are considered in terms of a model which recognizes the existence of both longer M-X bridge bonds and comprise bridge angles. Nonbonding repulsion between M atoms is concluded to not be a significant factor in these structures. The effects of packing and metal-metal bonding are also considered.

27480 Binding of ethylene to platinum and palladium. An ab initio study of the $MCl_3(C_2H_4)^-$ species. Hay, P.J. (Los Alamos Scientific Lab., NM). *Journal of the American Chemical Society ;* **103**: No. 6, 1390-1393(25 Mar 1981).

The structures and bonding of the metal-olefin π-complexes $PtCl_3(C_2H_4)^-$ and $PdCl_3(C_2H_4)^-$ are investigated with ab initio calculations in an extended basis. Relativistic effective core potentials are employed on Pd and Pt to replace the core electrons and to incorporate the relativistic effects on the valence electrons. The optimized geometries of the Pt-C_2H_4 and Pd-C_2H_4 complexes are discussed and compared with the structure determined by neutron diffraction for $KPtCl_3(C_2H_4)$. The calculated barrier to rotation in Zeise's salt (15 kcal/mol) is in good agreement with observed barriers (10 to 14 kcal) in platinum-olefin complexes. The barriers to rotation and binding energies both decrease in the order Pt > Pd. The results are compared to the Dewar-Chatt-Duncanson model of metal-olefin bonding.

27481 Closed three-center carbon-hydrogen-metal interaction. A neutron diffraction study of $HFe_4(eta^2\text{-}CH)(CO)_{12}$. Beno, M.A. (Argonne National Lab., IL); Williams, J.M.; Tachikawa, M.; Muetterties, E.L. *Journal of the American Chemical Society ;* **103**: No. 6, 1485-1492(25 Mar 1981).

The crystal and molecular structure of $HFe_4(eta^2\text{-}CH)(CO)_{12}$ has been determined at 173 K by x-ray diffraction and at 26 K by neutron diffraction techniques. The complex crystallized in the monoclinic space group with unit-cell dimensions of a = 8.694 (1) A, b = 32.920 (6) A, c = 13.757 (3) A, β = 112.95 (1)°, and V = 3625.7 A^3 at 26 K with Z = 8. Full-matrix least-squares refinement of the neutron data gave $R(F_o)$ = 0.060 and R/sub w/(F_o^2) = 0.079 for all 5663 data. The goodness-of-fit, with a data to parameter ratio of 10.1:1, was 1.876. The only significant structural differences in the two unique molecules of the asymmetric unit were the intermolecular contacts. The iron atoms were arranged in a butterfly conformation with a C-H group nestled between the wings. The most significant structural finding was a true C-H-Fe three-center interaction, containing both a very short Fe-H distance of 1.753 (4) A (1.747 (4) A, second molecule) and the longest reported C-H bond distance, 1.191 (4) A (1.176 (4) A). The results have been discussed in relation to the origin and nature of this C-H-Fe three-center interaction, the activation of C-H bonds in catalysis, and possible eta^2 bonding of a C-H fragment at a metal surface.

27482 Phosphine substitution in (eta^5-cyclopentadienyl)bis(triphenylphosphine)cobalt(I): evidence for a dissociative mechanism. Janowicz, A.H.; Bryndza, H.E.; Bergman, R.G. (Univ. of California, Berkeley). Contract W-7405-ENG-48. *Journal of the American Chemical Society ;* **103**: No. 6, 1516-1518(25 Mar 1981).

The substitution of trimethylphosphine for triphenylphosphine in (eta^5-cyclopentadienyl)bis(triphenylphosphine)cobalt(I) (1) to form (eta^5-cyclopentadienyl)(trimethylphosphine)(triphenylphosphine)cobalt(I) was studied at -60°C by NMR spectrometry. Kinetic measurements show the process to be first order in 1 and zero order in PMe_3; added PPh_3 strongly inhibits the reaction rate. This information indicates the reaction proceeds by rapid reversible phosphine dissociation through the unsaturated $CpCo(PPh_3)$ intermediate. The rate for generation of that intermediate, k_1, is 1.15 x 10^{-3} s^{-1} while the ratio of rate constant k_2 (for conversion of intermediate to products) to k/sub -1/ (return to starting materials) is 4 at -60°C. Possible structures for CpCo(L) are discussed in light of recent indications that the linear structure has a triplet ground state.

27483 X-ray absorption spectra of MnO_4^- and MnO_4^{2-} with synchrotron radiation: a study of structure and bonding properties of transition-metal complexes in solution. Sham, T.K.; Brunschwig, B.S. (Brookhaven National Lab., Upton, NY). *Journal of the American Chemical Society ;* **103**: No. 6, 1590-1591(25 Mar 1981).

Differences in the structures of the K x-ray absorption edges of solid $KMnO_4$ and aqueous solutions of permanganate and manganate are reported. The applicability of synchrotron radiation to the determination of solution structures is demonstrated by these results. The extended x-ray absorption fine structure (EXAFS) results for $KMnO_4$ (solid), $KMnO_4$ (aqueous), K_2MnO_4 (aqueous), and $Mn(H_2O_6)^{2+}$ (aqueous) are tabulated together with reference values of those obtained by x-ray crystal data. The data show that MnO_4^- acts as a unit in both solid and solution. The values for the metal-oxygen distances determined by EXAFS and x-ray crystal structure are in close agreement. The difference in the Mn-O bond distance Δr between MnO_4^- and MnO_4^{2-} in solution is 0.042 A.

27484 Mass spectrometric investigation of the vaporization thermodynamics and vapor composition of cadmium oxide. Behrens, R.G.; Mason, C.F.V. (Los Alamos Scientific Lab., NM). *Journal of the Less-Common Metals ;* **77**: 169-184(1981).

Mass spectrometric Knudsen effusion vaporization experiments on CdO(s) were performed over the temperature range 886 to 1090 K. The results confirm directly that CdO(s) vaporizes by decomposition according to the reaction CdO(s) = Cd(g) + 1/2 O_2(g). The equilibrium constant for this reaction was determined to be $\log_{10}K = [-((1.980 \pm 0.016) \times 10^4)/T] + (11.706 \pm 0.164)$ over the experimental temperature range. The second-law enthalpy change ΔH^0 (298.15 K) for the decomposition of CdO(s) derived from the present results was 92.82 +- 0.74 kcal mol^{-1} and the corresponding third-law value was 87.10 +- 2.03 kcal mol^{-0}. Averaging the present third-law value for ΔH^0 (298.15 K) with third-law values derived from literature vapor pressures gave a recommended value for ΔH^0 (298.15 K) of 87.89 +- 0.15 kcal mol^{-1}. This result is in excellent agreement with ΔH^0 (298.15 K) = 87.92 +- 0.3 kcal mol^{-1} derived independently from the enthalpies of formation for CdO(s) and Cd(g). CdO(g) was not observed in the equilibrium vapor of CdO(s) for temperatures up to 1150 K. This result gave a revised lower limit for the enthalpy of formation for CdO(g), i.e. ΔH^0/sub f/ (298.15 K) ≧ 27.2 kcal mol^{-1}.

27485 Mass transfer rate through liquid membranes: interfacial chemical reactions and diffusion as simultaneous permeability controlling factors. Danesi, P.R. (Argonne National Lab., IL); Horwitz, E.P.; Vandegrift, G.F.; Chiarizia, R. *Separation Science and Technology ;* **16**: No. 2, 201-211(1981).

Equations describing the permeability of a liquid membrane to metal cations have been derived taking into account aqueous diffusion, membrane diffusion, and interfacial chemical reactions as simultaneous permeability controlling factors. Diffusion and chemical reactions have been coupled by a simple model analogous to the one previously described by us to represent liquid-liquid extraction kinetics. The derived equations, which make use of experimentally determined interfacial reaction mechanisms, qualitatively fit unexplained literature data regarding Cu^{2+} transfer through liquid membranes. Their use to predict and optimize membrane permeability in practical separation processes by setting the appropriate concentration of the membrane carrier [LIX 64 (General Mills), a commercial β-hydroxy-oxime] and the pH of the aqueous copper feed solution is briefly discussed. 4 figures.

27486 Diffraction studies of ion-water interactions. Narten, A.H.; Triolo, R. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Pure and Applied Chemistry ;* **51**: 1649-1658(1979).

It has been shown that in order to obtain information on the relative position of atoms in solution, particularly the atoms in water or hydrated metal ion structures, two types of data must be obtained and combined. X-ray and neutron diffraction measurements both as a function of the relative concentrations of the atoms in question are determined. Data are shown for the combination of this type measurements to yield definition of ion positions and distances between ions in solutions. (BLM)

27487 (CONF-810675—1) Absorption spectrophotometric characterization of Sm(II), Sm(III), and Sm(II/III) bromides and Sm(III) oxybromide in the solid state. Wood, A.B.; Young, J.P.; Peterson, J.R.; Haschke, J.M. (Tennessee Univ., Knoxville (USA); Oak Ridge National Lab., TN (USA); Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). [nd]. Contract AS05-76ER04447;W-7405-ENG-26. 6p. NTIS, PC A02/MF A01. Order Number DE81023215.

From 15. rare earth research conference; Rolla, MO, USA (15 Jun 1981).

Absorption spectra obtained from $SmBr_3$, $SmBr_2$, and Sm0Br were used in identifying the samarium species in several mixed-valence Sm(II/III) compounds produced by H_2 reduction of $SmBr_3$. The nature of the absorption of Sm0Br made it possible to detect even traces of Sm0Br in the Sm bromides.

4003 Organic Chemistry

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27488 (CONF-8006179—1) Mechanism of the homogeneous hydrogenation of carbon monoxide. Rathke, J.W.; Feder, H.M. (Argonne National Lab., IL (USA)). 1981. Contract W-31-109-ENG-38. 22p. NTIS, PC A02/MF A01. Order Number DE81023571.

From 8. conference of the Organic Reaction Catalysis Society; New Orleans, LA, USA (2 Jun 1980).

A study delineating the major mechanistic features of the $HCo(CO)_4$ catalyzed carbon monoxide hydrogenation is reported. A reaction path involving hydrogen migration to a coordinated carbonyl to give a formyl complex, followed by additional hydrogen migrations to yield a coordiated formaldehyde complex, appears to fit the data best. The primary reaction products - methanol, methyl formate, and ethylene glycol - are formed as a result of hydrogen migration to oxgyen or carbon in $(^2h\text{-}H_2CO)CoH(CO)_3$ to form hydroxymethyl or methoxy groups.

27489 Methanesulfonic acid catayIzed cyclization of 3-arylpropanoic and 4-arylbutanoic acids to 1-indanones and 1-tetralones. Premasagar, V.; Palaniswamy, V.A.; Eisenbraun, E.J. (Oklahoma State Univ., Stillwater). *Journal of Organic Chemistry ;* **46**: No. 14, 2974-2976(3 Jul 1981).

Since methanesulfonic acid (MSA), does not cause sulfonation of aromatic rings, it was used at elevated temperatures to prepare 1-indanones and 1-tetralones through cyclization of 3-arylpropanoic and 4-arylbutanoic acids. The twelve ketones which were prepared from MSA-catalyzed cyclization of 3 and 4-aryl substituted carboxylic acids are pesented in a table, along with their yields, time and temperature. Studies under a variety of temperatures, concentrations and reaction times show that 30 min. to 3 hours is needed for cyclization depending on the reactivity of the starting material. The use of neat MSA as a substitute for Friedel-Crafts catalyst was not promising. Trial studies in which m-xylene was treated with acetic acid in the presence of anhydrous MSA at 110°C for 3 hours gave low yields of acetylation product (ca. 30%), and gas chromatography analysis of the product showed unreacted m-xylene.

27490 Flash vacuum pyrolysis of 2,3-dialkyltetralins. Contract W-7405-ENG-82. *Journal of Organic Chemistry ;* **46**: No. 14, 2984-2985(3 Jul 1981).

The cleavage of alkyl groups from the 2- and 3-positions of tetralins is a facile process and the retro-Diels-Alder reaction of tetralins appears to be concerted.

27491 Absolute rate constant for the reaction of $O(^3P)$ with thiophene from 238 to 448 K. Lee, J.H.; Tang, I.N. (Department of Energy and Environment, Brookhaven National Laboratory, Associated Universities, Inc., Upton, New York 11973). *Journal of Chemical Physics ;* **75**: No. 1, 137-140(1 Jul 1981).

Interests in the gas-phase oxidation of organic sulfur compounds have become increasingly evident due to the important roles that these compounds may play in combustion processes, atmospheric chemistry, and photochemical air pollution. The rate constants for the reaction of $O(^3P)$ with thiophene (C_4H_4S) have been determined for the first time under pseudo-first-order reaction conditions, using the discharge flow—resonance fluorescence technique. The measured rate constants over a temperature reange 262—448 K are well represented by the Arrhenius expression $k = (3.34 \pm 0.34) \times 10^{-11}\exp[-(1130 \pm 60)/RT]$ cm^3 molecule^{-1} s^{-1}. However, a discontinuity in the Arrhenius plot is noted around 262 K. The results are discussed in terms of different reaction pathways and compared with other compounds having similar molecular structures and various reactivities.

27492 Formation of gas-phase π-allyl radicals from propylene over bismuth oxide and γ-bismuth molybdate catalysts. Martir, W.; Lunsford, J.H. (Texas A & M Univ., College Station). *Journal of the American Chemical Society ;* **103**: No. 13, 3728-3732(1 Jul 1981).

Gas-phase π-allyl radicals were produced when propylene reacted over Bi_2O_3 and γ-bismuth molybdate catalysts at 723 K. The pressure in the catalyst zone was varied between 5×10^{-3} and 1 torr. The radicals were detected by EPR spectroscopy together with a matrix isolation technique in which argon was used as the diluent. The matrix was formed on a sapphire rod at 12 K which was located 33-cm downstream from the catalyst. Bismuth oxide was more effective in the production of gas-phase allyl radicals than γ-bismuth molybdate. By contrast α-bismuth molybdate was ineffective in forming allyl radicals and MoO_3 acted as a sink for radicals which were produced elsewhere in the system. Comparison of the π-allyl radical and the stable product concentrations over Bi_2O_3 revealed that gas-phase radical recombination reactions served as a major pathway for the formation of 1,5-hexadiene. Addition of small amounts of gas-phase oxygen increased the concentration of allyl radicals, and at greater oxygen levels allyl peroxy radicals were detected. Because of the effect of temperature on the equilibrium between allyl and allyl peroxy radicals, the latter product must be formed in the cooler part of the system.

27493 Magnetic and micellar effects on photoreactions. 1. ^{13}C isotopic enrichment of dibenzyl ketone via photolysis in aqueous detergent solution. Turro, N.J. (Columbia Univ., New York, NY); Chow, M.F.; Chung, C.J.; Kraeutler, B. *Journal of the American Chemical Society ;* **103**: No. 13, 3886-3891(1 Jul 1981).

The photolysis of dibenzyl ketone (DBK) in homogeneous organic solutions and in micelle-containing detergent solutions has been investigated from the standpoint of determining the extent and location of ^{13}C enrichment that occurs. In a series of experiments it is established that for incomplete conversions the residual, recovered DBK is enriched in ^{13}C relative to the initial unphotolyzed DBK. The efficiency of the $^{13}C/^{12}C$ separation is shown to be characterized by an isotope enrichment parameter, α, which is independent of the extent of conversion. A combination of mass spectrometry and nuclear magnetic resonance spectroscopy provides support for the primary location of the ^{13}C enrichment at C-1 (the carbonyl carbon) with a lesser but significant enrichment at C-2 (the methylene carbon). A very small but experimentally distinct enrichment of the aromatic rings is indicated by ^{13}C NMR analysis. An isomer of DBK, 1-phenyl-4'-methylacetophenone (PMAP) is formed as a minor product of photolysis in micellar solutions. PMAP, like the recovered, residual DBK, is found to be substantially enriched in ^{13}C relative to the starting DBK. The magnitude of α is found to be significantly influenced by the application of laboratory magnetic fields to the photolysis sample. The latter result, along with the unusually large magnitude of α, suggests that the mechanism involved in isotopic enrichment is not dominated by kinetic mass isotope effects but rather by nuclear magnetic moment and/or magnetic spin isotope effects.

27494 Magnetic and micellar effects on photoreactions. 2. Magnetic isotope effects on quantum yields and magnetic field effects on separation efficiency. Correlation of ^{13}C-enrichment parameters with quantum yield measurements. Turro, N.J. (Columbia Univ., New York, NY); Anderson, D.R.; Chow, M.F.; Chung, C.J.; Kraeutler, B. *Journal of the American Chemical Society ;* **103**: No. 13, 3892-3896(1 Jul 1981).

The quantum yields (PHI) and ^{13}C isotopic enrichment parameters (α) for photolysis of dibenzyl ketone in aqueous detergent solution have been measured as a function of applied magnetic field and isotopic substitution. A quantitative correlation is shown to exist betwen the magnitude of α and quantum yield data. The mechanism of ^{13}C enrichment and the magnetic field effects are discussed and shown to be mechanistically related.

27495 Sudden polarization effect: MC-SCF calculations on planar and 90° twisted methylenecyclopropene. Johnson, R.P.; Schmidt, M.W. (Iowa State Univ., Ames). Contract W-7405-ENG-82. *Journal of the American Chemical Society ;* **103**: No. 12, 3244-3249(17 Jun 1981).

Ab initio MC-SCF molecular orbitals are reported for electronic ground and excited states of planar and 90° twisted methylenecyclopropene within the framework of a four π-orbital FORS (full optimized reaction space) model. For planar methylenecyclopropene, individual state MC-SCF results include: ground state dipole moment, 1.33 D, and excitation energies, 3.32 eV ($^3B_2$), 4.71 eV ($^1B_2$), 4.87 eV ($^3A_1$), and 9.36 eV (2^1A_1). The SCF first ionization potential is 8.1 eV. Calculations for the 90° twisted species at a MNDO optimized geometry for the lowest diradical state ($^1D_1$) yield states having diradical (D) or pronounced zwitterionic (Z) character. Variational MC-SCF results are (excitation energy, dipole moment): $^1A_2$ ($^1D_1$) 0.0 eV, 0.67 D; $^3A_2$ ($^3D_1$) -0.06 eV, 0.65 D; $^3B_1$ ($^3D_2$) 0.53 eV, -0.96 D; 1^1A_1 ($^1Z_1$) 0.59 eV, 5.34 D; $^1B_1$ ($^1D_2$) 0.65 eV, -0.94 D. CI results for the second zwitterionic state 2^1A_1 ($^1Z_2$) are 7.58 eV and -5.83 D. These calculated properties, especially for the case of the twisted species, are highly sensitive to the method of calculation. CI calculations using ground state ($^1D_1$) orbitals led to significantly exaggerated dipole moments and state energies. 3 figures, 5 tables.

27496 Electron spin resonance and electron spin echo studies of photoproduced tetramethylbenzidine cation radical in frozen aqueous micellar solutions: cation surroundings and retention of micellar structure in frozen solutions. Narayana, P.A.; Li, A.S.W.; Kevan, L. (Univ. of Houston, TX). Contract AS05-80ER10745. *Journal of the American Chemical Society ;* **103**: No. 12, 3603-3604(17 Jun 1981).

ESR and electron spin echo (ESE) modulation can deduce the surrounding structure of paramagnetic species in frozen solutions. These techniques are applied to N,N,N',N'-tetramethylbenzidine (TMB) in anionic micelles. It is shown that the micellar structure is retained in frozen solutions.

27497 Intramolecular electron transfer and dehalogenation of anion radicals. 4. Haloacetophenones and related compounds. Behar, D.; Neta, P. (Univ. of Notre Dame, IN). *Journal of the American Chemical Society ;* **103**: No. 9, 2280-2283(6 May 1981).

Halogen-substituted acetophenones and several other carbonyls and carboxyl derivatives were reduced with e/sub aq/$^-$ in irradiated aqueous solutions to produce the anion radicals. In certain cases, reduction by $(CH_3)_2CO^-$ was also used. The anion radicals undergo intramolecular electron transfer and dehalogenation to yield inorganic halide ions. The rates of these reactions varied over a wide range (10^1-$10^7 s^{-1}$) and were strongly dependent on the nature of the halogen and the other substituent and their relative positions in the molecule. The results obtained here are discussed along with previous measurements on cyano and nitro derivatives. The rate of dehalogenation is found to be dependent on the electron affinity of the other substituent on the ring. Hammett's substituent constants do not correlate with the observed rates. However, spin density distribution in the anion radicals, as derived from ESR parameters, yields a good qualitative correlation. Increased spin density on the ring carbon bearing the halogen is accompanied by an increase in the rate of C-X bond scission. The spin density represents in this case the negative charge density, since protonation of the anion radicals in minor changes in spin densities but causes a dramatic decrease of the rate of dehalogenation. 3 figures, 2 tables.

27498 Isolation and characterization of pyrimidine-psoralen photoadducts from DNA. Straub, K.; Kanne, D.; Hearst, J.E.; Rapoport, H. (Univ. of California, Berkeley). *Journal of the American Chemical Society ;* **103**: No. 9, 2347-2355(6 May 1981).

We have examined the photoadducts of 4'-hydroxymethyl-4,5',8-trimethylpsoralen (HMT) and native DNA. Five nucleoside-HMT monoaddition products have been isolated and characterized, corresponding to three deoxythymidine-HMT and two deoxyuridine (derived from deoxycytidine)-HMT adducts. Structural assignments are based on high resolution mass spectrometry and ^1H NMR studies, including homonuclear spin decoupling and nuclear Overhauser effect (NOE) experiments. The results of this study indicate that (1) a limited number of nucleoside-psoralen adducts are formed with native, double-stranded DNA, and (2) the sterochemistry of the adducts is apparently determined by the geometry of the noncovalent intercalative complex formed by HMT and DNA prior to irradiation. 8 figures, 8 tables.

27499 Hexaammineruthenium(II,III) and pentaamminedinitrogenruthenium(II). A Hartree-Fock-Slater study. Ondrechen, M.J.; Ratner, M.A.; Ellis, D.E. (Northwestern Univ., Evanston, IL). Contract W-7405-ENG-48. *Journal of the American Chemical Society ;* **103**: No. 7, 1656-1659(8 Apr 1981).

Discrete variation method Hartree-Fock-Slater studies are reported for the title compounds. The significant σ covalency and strong π back-bonding in the dinitrogen complex are apparent from populations, energy shifts, optical spectra, and reorganization effects on optical excitation; the energy levels are strongly perturbed by the strong covalency from their pseudoctahedral crystal field values. Transition-state calculations yield optical and photoemission results in good agreement with experiments. In the dinitrogen compound, the directly bonded N is considerably more negative, in agreement with simple electrostatic and bonding arguments.

27500 Cation-complexing properties of synthetic macrocyclic polyether-diester ligands containing the furan, benzene, tetrahydrofuran, and thiophene subcyclic units. Bradshaw, J.S.; Baxter, S.L.; Lamb, J.D.; Izatt, R.M.; Christensen, J.J. (Brigham Young Univ., Provo, UT). Contract ER-78-S-02-5016. *Journal of the American Chemical Society ;* **103**: No. 7, 1821-1827(8 Apr 1981).

The synthesis of 13 new macrocyclic polyether-diester ligands containing the furan, 3,4-dimethoxyfuran, tetrahydrofuran, and thiophene subcyclic by the reaction of a diacid dichloride with the appropriate glycol is described. The complexation properties of these ligands with alkylammonium and metal cations were determined and compared with the crown ethers. The free energies of activation ($\Delta G^{\ddagger}$) for the dissociation of the alkylammonium complexes were determined from their temperature-dependent ^1H NMR spectra. The relative kinetic stability (as measured by the $\Delta G^{\ddagger}$ values) for the complexes between benzylammonium perchlorate and ligands containing an aromatic subcyclic unit increased with increasing ring size in the order 18-<21-<24-membered ring. Formation constants as well as ΔH and $T\Delta S$ values were determined in methanol by a calorimetric titration technique for the reaction of Na^+, K^+, Cs^+ and Sr^{2+} with the tetrahydrofurano ligands. The 21- and 24-membered ring compounds containing a furan subcyclic unit were found to be effective carriers of Cs^+ across a $CHCl_3$ ligand membrane separating aqueous phases.

27501 Structure sensitivity of cyclohexane dehydrogenation and hydrogenolysis catalyzed by platinum single crystals at atmospheric pressure. Herz, R.K.; Gillespie, W.D.; Petersen, E.E.; Somorjai, G.A. (Univ. of California, Berkeley). *Journal of Catalysis ;* **67**: No. 2, 371-386(Feb 1981).

The dehydrogenation and hydrogenolysis of cyclohexene catalyzed by platinum single-crystal surfaces has been investigated at total reactant pressures of 115 to 760 Torr and temperatures of 533 to 573 K. The flat (111), stepped (557), and kinked (25, 10, 7) and (10, 8, 7) surfaces used in this study were characterized in ultrahigh vacuum by low-energy electron diffraction and Auger electron spectroscopy, before and after reaction experiments. Benzene, cyclohexane, n-hexane, and alkane fragments with carbon number less than 6 were observed as reaction products. The rate of dehydrogenation to benzene on the four surfaces increased in the order (111) < (557) < (10, 8, 7) < (25, 10, 7). On the other hand, the hydrogenolysis rates and the rate of cyclohexene production were highest on the (111) surface. In general, the reaction rates decreased with increasing reaction time. The decrease of the dehydrogenation rates was due to reversible product inhibition by benzene, as well as the irreversible adsorption of tightly bound carbonaceous deposits. The hydrogenolysis rates did not exhibit product inhibition and decreased solely as the result of the irreversibly adsorbed carbonaceous species. The strength of inhibition by benzene increased in the order (25, 10, 7) < (10, 8, 7) < (557) < (111). These high-pressure results using single-crystal catalysts are compared to similar studies previously performed at pressures of less than 10^{-5} Torr. A comparison is also made to studies by others using dispersed platinum catalysts.

27502 Study of thermoxidative stability of natural and halocarbon waxes. Wagner, J.A.; Arnold, C. Jr. (Sandia Labs., Albuquerque, NM). Contract AT(29-1)-789. *Journal of Materials Science ;* **14**: 2119-2127(1979).

A number of contamination problems in the assembly of hybridmicrocircuits have been traced to the presence in the systems of degraded waxes. No information was available on the composition or stability of the natural waxes which are used extensively in the etching, shipping, and storing of hybridmicrocircuit components. In this study, the composition and thermoxidative stability of three commercial waxes were defined. It was found that oxidation can occur at temperatures of 100°C; at high temperatures (150°C) the waxes are converted to insoluble chars. Vaseline, which is sometimes used as an additive, was found to have no effect on the stability of the waxes. Waxes made from poly(chlorotrifluoroethylene), available from Halocarbon Corporation, were found to be chemically stable and stable toward thermoxidation under the conditions used in the industry and are recommended as replacements for the natural waxes. 10 figures, 2 tables.

4004 Electrochemistry

REFER ALSO TO CITATION(S) 27281, 27283

27503 (CONF-8010205—1) Evaluation of the single and double pulse galvanostatic relaxation techniques for the measurement of the kinetics of fast electrode reactions in molten salts. Nagy, Z. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 50p. NTIS, PC A03/MF A01. Order Number DE81023907.

From 3. international symposium on molten salts; Hollywood, FL, USA (Oct 1980).

It is shown that the maximum measurable standard heterogeneous rate constant is not a sufficient indication of the limitations of a relaxation technique. The errors of the measurement, and consequently the limits of applicability, can only be described generally by certain characteristic times of the electrode system. These are tau/sub c/, the time constant of the double layer capacitance - reaction resistance system and tau/sub d/, the time constant of the diffusion impedance - reaction resistance system. A graphical representation of the field of applicability of a technique is introduced using the log κ vs log tau/sub c/ diagram, where κ, the rate constant parameter, is equal to (π/4 tau/sub d/)/sup 1/2/. Within the field of applicability, the technique can be used to obtain the exchange current density with an error of less than +-20%. Such a representation is completely general and can be useful for a meaningful comparison of all relaxation techniques. Such diagrams are presented for the single and double pulse galvanostatic techniques, with data evaluations by graphical and computer curve-fitting methods. The comparison of the two evaluation methods reveals the general superiority of computer curve-fitting, which extends the field of applicability for both relaxation techniques to about one order of magnitude faster reactions. Comparison of the single and double pulse techniques reveals the superiority of the latter for fast reactions, the improvement being about one order of magnitude in the measurable κ (equivalent to one order of magnitude faster reactions).

27504 Redox behavior of the $[Rh_2(1,3\text{-diisocyanopropane})_4]_2^{6+}$ ion at the rotating glassy carbon electrode. Mann, K.R. (Univ. of Minnesota, Minneapolis); Parkinson, B.A. Contract W-7405-ENG-82. *Inorganic Chemistry ;* **20**: No. 6, 1921-1924(Jun 1981).

The results of both the oxidation and reduction of the $[Rh_2(bridge)_4]_2^{6+}$ (bridge = 1,3-diisocyanopropane, n = 2,3,4) ion in acedic media at a rotating glassy carbon disk electrode are reported. It is interesting to speculate about the relationship between the extreme irreversibility of the oxidation-reduction reactions and the photochemical production of hydrogen gas from hydrogen ions which have been observed for the Rh_4^{6+} system. Due to the high-energy requirement for the reduction of hydrogen ions to hydrogen gas via hydrogen atom intermediates and the related back-electron-transfer problem encountered in excited-state electron-transfer reactions, systems such as the $[Rh_2(bridge)_4]_2^{6+}$ system, which are capable of undergoing irreversible two-electron-transfer reactions, will have distinct advantages in the production of hydrogen gas from aqueous solutions. Clearly, systems which display normal behavior (i.e., undergo reversible one-electron transfers) are systems which are unlikely to be able to cause H-H bond formation since they will be unable to supply the second electron to complete the formation of the H_2 bond before a back-electron-transfer step regenerates hydrogen ions.

27505 Grain-boundary effect in doped ceria solid electrolytes. Wang, D.Y.; Nowick, A.S. (Columbia Univ., NY). Contract ER-78-S-02-4693. *Journal of Solid State Chemistry ;* **35**: No. 3, 325-333(Dec 1980).

The ac electrical behavior of sintered polycrystalline CeO_2:CaO and CeO_2:Y_2O_3 solid electrolytes is studied. Complex impedance plots show the presence of an extra arc due to the presence of relatively high-resitivity material along the grain boundaries. This grain-boundary effect is greatest for dilute solid solutions and pure samples and becomes vanishingly small for dopant concentrations $\geq$ 15 mole %. The effect can also be reduced by shortening the sintering time. The activation enthalpy for the grain-boundary conductivity is substantially higher than that of the lattice

conductivity, especially at low dopant levels. This fact eliminates the Bauerle constriction model. The results suggest that the effective dopant concentration near the grain boundaries may be substantially reduced from the bulk value. 10 figures, 3 tables.

27506 **Chemical diffusion in intermediate phases in the lithium-tin system.** Wen, C.J.; Huggins, R.A. (Stanford Univ., CA). Contract EC-77-S-02-4506. *Journal of Solid State Chemistry ;* **35**: No. 3, 376-384(Dec 1980).

The compositional variation of the chemical diffusion coefficient in the six intermediate phases LiSn, Li_7Sn_3, Li_5Sn_2, $Li_{13}Sn_5$, Li_7Sn_2, and $Li_{22}Sn_5$ of the lithium-tin system at 415°C has been measured. Among these intermediate phases, the phase $Li_{13}Sn_5$ has the highest chemical diffusion coefficient, varying with composition from 5.01×10^{-5} to 7.59×10^{-4} cm^2/sec at that temperature. Combining this information with coulometric titration curves (emf versus composition), the self-diffusion coefficient of lithium has also been determined in the various intermetallic phases as a function of composition under the assumption that the tin atoms do not move appreciably compared with the lithium atoms. The lithium self-diffusion coefficient in the phase LiSn is lower than those in the more lithium-rich phases by one order of magnitude. This result is discussed in terms of the difference between the crystal structures of LiSn and the other lithium-rich phases in the lithium-tin system. 12 figures.

4005 Photochemistry

REFER ALSO TO CITATION(S) 27005, 27493, 27494

27507 **Luminescence tuning of 2,2'-bipyridine and 1,10-phenanthroline complexes of iridium(III) in fluid solution.** Watts, R.J. (Univ. of California, Santa Barbara). Contract AT03-78ER70277. *Inorganic Chemistry ;* **20**: No. 7, 2302-2306(Jul 1981).

Luminescence quantum yields, lifetimes, and spectra of a series of cis-dichlorobis(2,2'-bypyridine) and -(1,10-phenanthroline) complexes of Ir(III) in water, methanol, acetonitrile, and dimethlyformamide at 295°K are reported. Two emission bands originating from states of dd* and $d\pi^*$ or mixed $d\pi^*$-$\pi\pi^*$ parentage are observed when 2,2'-bipyridine, 1,10-phenanthroline, or 5,6-dimethyl-10-phenanthroline are the coordinated bidentate ligands. A single $d\pi^*$ or mixed $d\pi^*$-$\pi\pi^*$ emission is observed when 4,7-diphenyl-1,10-phenanthroline or 4,4'-diphenyl-2,2'-bipyridine occupies coordination sites. In all cases, the emitting states are found to be in thermal equilibrium in the fluid solvents at 295°K. The ratio of dd* to $d\pi^*$ or mixed $d\pi^*$-$\pi\pi^*$ emission intensity is solvent dependent; the dd* emission is generally favored by water whereas the $d\pi^*$ or mixed $d\pi^*$-$\pi\pi^*$ band is favored by the nonaqueous solvents. Lifetimes (tau) and overall quantum yields (Q) are strongly solvent dependent in all cases, displaying a range of values that differ by more than 2 orders of magnitude between water and acetonitrile in some instances. However, the tau/Q ratios are quite insensitive to solvent. The change of orbital parentage of the lowest excited state from dd* $(IrCl_2(bpy)_2^+$ or $IrCl_2(phen)_2^+)$ to $d\pi^*$ or mixed $d\pi^*$-$\pi\pi^*$ $(IrCl_2(4,4'\text{-}Phbpy)_2^+$ indicate that these complexes would be useful to further studies of photochemical tuning.

27508 **Photochemistry of copper(II) complexes with macrocyclic amine ligands.** Muralidharan, S.; Ferraudi, G. (Univ. of Notre Dame, IN). *Inorganic Chemistry ;* **20**: No. 7, 2306-2311(Jul 1981).

The photochemical properties of $Cu(dl\text{-}Me_6[14]aneN_4)^{2+}$ and $Cu(rac\text{-}Me_6[14]aneN_4)^{2+}$ in the presence and absence of axially coordinated ligands have been investigated by continuous and flash irradiations. Flash photolysis of the complexes in deaerated aqueous solutions revealed the presence of copper-ligand radical complexes with closed- and open-cycle ligands. Flash photolysis of methanolic solutions of the complexes, in the presence of halides and pseudohalides, shows Cu(III) macrocyclic intermediates. The experimental observations can be explained in terms of two primary photoprocesses with origins in distinctive charge transfer to metal states. These states have been assigned as amino to copper(II) charge-transfer state and acido to copper(II) charge-transfer state.

27509 **147-nm photolysis of phosphine and phosphine-d_3.** Blazejowski, J.; Lampe, F.W. (Pennsylvania State Univ., University Park). Contract AS02-76ER03416-17. *Journal of Physical Chemistry ;* **85**: No. 13, 1856-1864(25 Jun 1981).

The 147-nm photodecompositions of PH_3 and PD_3 result in the formation of H_2 (D_2) and P_2H_4 (P_2D_4) in the gas phase and a solid deposit which is probably a mixture of phosphorous and polymeric phosphorous hydrides (PH)/sub x/ and (PD)/sub x/. The quantum yields for the gaseous products and for depletion of reactants were measured and were found to increase with increasing pressure of phosphine and to decrease with increasing light intensity. All quantum yields for PD_3 are lower than those for PH_3. Isotope distribution analysis of the diphosphines formed in the photolysis of PH_3-PD_3 mixtures indicates that diphosphine is formed principally via combination of PH_2 (PD_2) radicals. A mechanism involving these primary photodissociations is proposed which is in accord with the experimental facts. The thermal decomposition of P_2H_4 at ambient temperature (~ 300 K) is shown to be second order with a specific reaction rate of $(4.25 +- 0.18) \times 10^{-18}$ cm^3/(molecule s). 6 figures, 3 tables.

27510 **Slow multiphoton excitation as a probe of bimolecular and unimolecular reaction energetics. Multiphoton dissociation of proton bound alcohol dimers.** Bomse, D.S.; Beauchamp, J.L. (California Inst. of Tech., Pasadena). *Journal of the American Chemical Society ;* **103**: No. 12, 3292-3296(17 Jun 1981).

Proton bound dimers of simple aliphatic alcohols $(R_1OH)H^+(R_2OH)$ where $R_1 = R_2 = CH_3$, C_2H_5, i-C_3H_7, n-C_3H_7, s-C_4H_9, t-C_4H_9, and t-C_5H_{11} are intermediates formed in gas phase reactions of the corresponding protonated alcohols with neutral alcohols. Products from the decomposition of these chemically activated species are compared with those obtained by slow multiphoton excitation. In addition, it is shown that isomeric ions are distinguished by formation of different sets of decomposition products. Also, we report the first observation of multiple sets of products arising from low-power infrared activation. This result is due to an exothermic isomerization in the transition state which makes accessible more than one reaction pathway. Use of infrared multiphoton excitation as a complementary technique to collisional activation of ions in mass spectrometric analysis of mixtures is discussed. For this study, ions are formed, stored, and detected by using techniques of ion cyclotron resonance (ICR) spectroscopy.

27511 **Intramolecular energy transfer in a rhodium (III) metalloorganic bichromophore system. Photochemical and photoluminescence studies.** Bergkamp, M.A.; Watts, R.J.; Ford, P.C. (Univ. of California, Santa Barbara). *Inorganic Chemistry ;* **20**: No. 6, 1764-1767(Jun 1981).

Reported are the photochemical, photoluminescence, and spectral studies of a series of pentaammine(organonitrilo)rhodium(III) compounds, $Rh(NH_3)_5(NRC)^{3+}$ (where R is a phenyl, benzyl, or 2-phenylethyl group or a substituted derivative). The absorption spectroscopy exhibits features attributable to both $\pi\pi^*$ and ligand field transitions. The luminescence spectra, however, exhibit only ligand field (LF) emissions regardless of whether the $\pi\pi^*$ of LF states are initially populated. The luminescence lifetimes at 77°K are also characteristic of LF states. Irradiation of the $\pi\pi^*$ or LF bands in aqueous solutions leads to photosubstitution of the organonitrile ligand with the quantum yields being somewhat smaller for λ/sub irr/ = 254 nm ($\pi\pi^*$) than 313 nm (LF) in mose cases. The results are discussed in terms of the efficiency of interconfigurational energy transfer between $\pi\pi^*$ and LF states.

27512 **Photogeneration of an active formate-decomposition catalyst.** King, A.D. Jr.; King, R.B.; Sailers, E.L. III. (Univ. of Georgia, Athens). Contract EY-76-S-09-0933. *Journal of the American Chemical Society ;* **103**: No. 7, 1867-1868(8 Apr 1981).

Some preliminary observations on the decomposition of an active formate species in the reaction of the group 6 metal carbonyl catalyzed water gas shift process were made using a photolytically-generated $W(CO)_5$ intermediate. H_2 production from the aqueous solutions containing Na format and $W(CO)_6$ was much more rapid for illuminated solutions than for non-illuminated. However, no

measurable hydrogen was produced from either illuminated or non-illuminated solutions when Na formate was replaced by KOH. Essentially the same results were noted for the photolytically-catalyzed production of H_2 when solutions of tetrahydrofuran were used. It is thus concluded that the H_2 and CO must result from decomposition of the formate ion in the reaction mixture and that the $W(CO)_6$ is a precursor of the catalytically active $W(CO)_5$. (BLM)

27513 Microscopic observations on the thermal decomposition of α-aluminum hydride. Herley, P.J.; Christofferson, O.; Todd, J.A. (State Univ. of New York, Stony Brook). Contract E(11-1)-2715. *Journal of Solid State Chemistry ;* **35**: No. 3, 391-401(Dec 1980).

The various isothermal and photolytic decomposition stages of α-aluminum hydride have been examined by scanning electron microscopy. The pristine material consists of cuboids, 50 to 100 μm on a side, some of which are contact or interpenetrating twins. The interpenetrating twin axis appears to be the [001] body diagonal of the cuboids. The cuboids' surface, which has been chemically treated to promote thermal stability, contains faceted pits whose sides lie among close-packed directions. The pit interiors show evidence of layering. During the thermal induction period, patches containing acicular filaments, each ~ 0.005 μm in diameter and ~ 0.3 μm in length, of Al-metal are formed and are dispersed randomly on the internal crystal surfaces. During the acceleratory period, a large number of additional patches appear in which some of the filaments cluster together to form small clumps. The acicular filaments in all patches thicken and increase slightly in length as the reaction proceeds. Later in the acceleratory period, bubbles (0.2 to 3.5 μm in diameter) appear. The bubbles are randomly distributed throughout the cuboid and produce isolated volumes (~ 2 to 7 μm in diameter) of partially reacted AlH_3. Eventually, the filaments spread over the entire internal substructure of the cuboid. However, although completely decomposed, the cuboid remains intact. Preexposure to 1.0 x 10^9R ^{60}Co γ rays blackens the surface and produces a rougher external surface with some densely decomposed patches and many more filaments. Additional patches containing denser clusters of acicular nuclei were observed in the surface after uv photolysis at room temperature and at 150°C. At 150°C declamination of the surface layer occasionally occurs in the coirradiated material. The increased number of nuclei formed by preirradiation and uv photolysis confirm kinetic studies which postulate the presence of additional nuclei formed by the irradiation.

27514 Photo-induced reactions of benzo(a)pyrene with DNA in vitro. Strniste, G.F.; Martinez, E.; Martinez, A.M.; Brake, R.J. (Los Alamos Scientific Lab., NM). *Cancer Research ;* **40**: 245-252(Feb 1980).

The induction of lesions in DNA by combinations of benzo(a)pyrene (B(a)P) and near-ultraviolet light (NUV) with wavelengths of 300 to 480 nm was investigated. Using centrifugal methods or agarose gel electrophoretic techniques to monitor the conversion of the superhelical double-stranded PM2 DNA to the relaxed circular form, it was possible to quantitate the rates of single-strand breakage in the DNA when analyzed in neutral or alkaline conditions. Irradiation of a B(a)P and DNA mixture with NUV resulted in a 12-fold increase in the single-strand breaks observed, compared to breaks induced by radiation alone. In oxygen, there were about 40% more single-strand breaks induced compared to breaks induced in an argon environment. Rates of the single-strand breakage observed under alkaline conditions were 1- to 2-fold greater than those observed in neutral conditions. Using a phenol extraction procedure and molecular sieve column chromatographic methods, it was possible to quantitate the amount of B(a)P that was bound to the DNA as a function of NUV fluence. In an argon-saturated medium, 12 B(a)P molecules were bound per PM2 genome per single-strand break, whereas about 16 B(a)P molecules were bound per PM2 genome per single-strand break when irradiation was performed in oxygen. From studies concerning the alkaline stability of bound B(a)P, it is concluded that as much as 30% of the B(a)P molecules bound in the presence of oxygen may be linked to the DNA through phosphotriester bonds. NUV-induced complexes of B(a)P and DNA that were enzymically digested to nucleoside residues and eluted through a Sephadex LH-20 column revealed several distinct peaks eluting through a 30 to 95% methanol gradient that were indicative of B(a)P-nucleoside adducts. 7 figures, 1 table.

27515 Multistep laser photoionization of the lanthanides and actinides. Worden, E.F. (Univ. of California, Livermore); Conway, J.G. Contract W-7405-ENG-48. *ACS (American Chemical Society) Symposium Series ;* No. 131, 381-425(1980).

Techniques of stepwise laser excitation and photoionization have been applied to study spectroscopic properties of neutral atoms of lanthanides and actinides. The spectroscopic properties that can be determined include: the ionization potential, energy levels, isotope shifts, hyperfine structure, lifetimes of energy levels, branching ratios and oscillator strengths. We discuss the laser methods used to obtain these properties (with emphasis on ionization potentials) and give examples of results obtained for each. The ionization potentials obtained by laser techniques are in eV: Ce, 5.5387 (4); Pr, 5.464 (12); Nd, 5.5250 (6); Sm, 5.6437(6); Eu, 5.6704(3); Gd, 6.1502(6); Tb, 5.8639(6); Dy, 5.9390(6); Ho, 6.0216(6); Er, 6.1077(10); U, 6.1941(5) and Np, 6.2657(6). Regularities in the f/sup N/s² - f/sup N/s ionization limits for the lanthanides have been found as a result of these accurate values and previously known accurate values for the others. Multistep photoionization has been employed for laser isotope separation and for studies of autoionization. 16 figures, 7 tables.

27516 Infrared phototolysis of SO_2. Bialkowski, S.E.; Guillory, W.A. (Univ. of Utah, Salt Lake City). AS02-78ER04695. *Chemical Physics Letters ;* **60**: No. 3, 429-430(15 Jan 1979).

Visible luminescence observed from the IR photolysis of SO_2 between 2 and 25 torr appears to be the result of the SO_2 afterglow. These results suggest the first possible IR photolysis of a triatomic molecule via collisional pumping.

4006 Radiation Chemistry

REFER ALSO TO CITATION(S) 27193, 27497, 27688, 27689

27517 (CONF-800392—(Vol.2), pp 213-231) **Scientific projection paper for radiation chemistry.** Simic, M.G. (Univ. of Texas, Austin). Mar 1980. NTIS, PC A22/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

Together with radiation physics, an understanding of radiation chemistry is necessary for full appreciation of biological effects of high and low energy radiations, and for the development of prophylactic, therapeutic and potentiating methods and techniques in biological organisms. Areas covered in some detail in this report include: the early chemical events involved in the deposition of radiation energy; the kinetics of free radical and excited state reactions; the application of radiation chemistry to radiation biology; and the availability of instrumentation.

27518 Decomposition of α-aluminum hydride powder. 1. Thermal decomposition. Herley, P.J.; Christofferson, O.; Irwin, R. (State Univ. of New York, Stony Brook). Contract E(11-1)-2715. *Journal of Physical Chemistry ;* **85**: No. 13, 1874-1881(25 Jun 1981).

The thermal decomposition kinetics of α-AlH_3 powder have been determined between 130 and 150°C. In this temperature range pristine and aged material, including powder which has been preirradiated with ^{60}Co γ-rays and high-intensity uv light, yielded sigmoidal fractional decomposition (α) vs time curves. In all cases the α(t) curves exhibited three successive decomposition stages. The initial-period data for all materials can be described by a cubic expression representing rapid nucleation which is followed by a period of slow growth. Avrami-Erofeyev (A to E) kinetics accurately describe the data for the subsequent acceleratory and decay stages. Aging the material modifies the exponent of the A to E equation and is considered as a change from a three-dimensional random growth of a layered reaction/product interface. Similar activation energies were obtained for both processes. The increase in the specific rate constants which is induced by, and which is proportional to, the γ-ray and uv dose can be attributed to the presence of additional decomposition sites. These conclusions are consistent with independent scanning electron microscope observations of partially decomposed crystals. The same activation energy, 157.0

+- 12.5 kJ/mol, was obtained for both the acceleratory and decay periods of unirradiated and irradiated powder. The induction-period activation energy for all materials is 103.8 +- 11.0 kJ/mol. The rate constants increase with irradiation dose in a nonlinear manner. Irradiation also shortened the induction period (I). The I vs total dose, PHI, data can be described by the equation $I = C_1 - C_2 \log PHI$, a relationship derived from exponential nuclei growth during heating and linear nuclei growth during irradiation. Irradiation increases the rate constants, and aging modifies the dimensionality of the A to E equation. 8 figures, 4 tables.

27519 **Decomposition of α-aluminum hydride power. 2. Photolytic decomposition.** Herley, P.J.; Christofferson, O. (State Univ. of New York, Stony Brook). Contract E(11-1)-2715. *Journal of Physical Chemistry ;* **85**: No. 13, 1882-1886(25 Jun 1981).

Similarly shaped pressure vs time curves are obtained in the temperature range from 26 to 70.6°C from the ultraviolet photolysis of aged α-AlH_3 powder, pristine and preirradiated with ^{60}Co γ-rays. The curves consist of an initial deceleratory period followed by a constant rate of gas evolution. The initial-period data can be resolved into one or two exponential terms depending on the sample and/or the pretreatment conditions. At room temperature, increasing the light intensity or preirradiating the material with γ-ray doses greater than 1.0 x 10^6R increases the rate constants obtained from fitting the kinetic data. Only one exponential term is found below 1.0 x 10^6R and at high lamp intensities. The linear rate has an almost, but not exact, second-order dependence on the light intensity. The dependence is ascribed to a decomposition event resulting from interaction between two excited radicals, one of which forms a radical-hole pair prior to the interaction. The linear rate deviates further from a second-order dependence for a 1.0 x 10^6R dose. The activation energies (kJ/mol) of the initial and linear rate periods are 3.2 (+- 0.9) and 13.0 (+- 0.9), respectively. Taken together these results suggest that two processes are initiated by uv light in α-AlH_3. The first process involves the interaction of the light-induced carriers with the precursor (intrinsic) defects exising in the material. This process is associated with the lower activation energy. The second process with the larger activation energy is the interaction of the light-induced carriers with each other to produce decomposition in a complex second-order relationship. Both processes are modified by irradiation in a manner consistent with a previously developed phenomenological theory. 5 figures.

27520 **Decomposition of α-aluminum hydride power. 3. Simultaneous photolytic-thermal decomposition.** Herley, P.J.; Christofferson, O. (State Univ. of New York, Stony Brook). Contract E(11-1)2715. *Journal of Physical Chemistry ;* **85**: No. 13, 1887-1892(25 Jun 1981).

The simultaneous effects of uv photolysis and thermal decomposition (coirradiation) on α-AlH_3 powder have been investigated between 60 and 150°C. From the kinetic analysis, this temperature range can be divided into two distinct regimes; the first region from 60 to 110°C delineates a transition between the photolysis and coirradiation, and the second region from 110 to 150°C involves only coirradiation. The fractional decomposition (α) vs time curves are sigmoidal in shape between 110 and 150°C much like the thermal decomposition data at these temperatures. The transition-region curves change with temperature and/or light intensity to resemble either the low-temprature photolysis or the high-temperature coirradiation curves. The high-temperature coirradiation α(t) curves are faster and have induction, acceleratory, and decay periods similar to those for the thermal decomposition, but different kinetics are applicable with lower activation energies (kJ/mol): (51.1 vs 107.0, 130.1 vs 158.0, and 132.8 vs 164.0, respectively). In the transition region, an empirical relationship describes the induction period, but the acceleratory period has the same linear relationship with time as the high-temperature coirradiation. The synergistic effect of uv light and heat is evidenced in the lower activation energies and faster decomposition rates noted for reactions involving the additional uv light stimulus. The changing interaction of light- and heat-induced species and the complex behavior of the resultant kinetics is noted during the transition region. 4 figures, 4 tables.

27521 **F_3NO^- radical anion. ESR spectra, structure, and its dissociation to F_2NO.** Hasegawa, A.; Hudson, R.L.; Kikuchi, O.; Nishikida, K.; Williams, F. (Univ. of Tennessee, Knoxville). *Journal of the American Chemical Society ;* **103**: No. 12, 3436-3440(17 Jun 1981).

The isotropic ESR spectrum of F_3NO^- in the SF_6 matrix has been obtained under conditions which minimize interference from signals due to other radicals and expose additional lines to those previously observed. These results confirm the higher order analysis of the spectrum in terms of hyperfine interaction with one nitrogen and three equivalent fluorines, exact matrix diagonalization calculations yielding the parameters $^{14}a(1) = 148.5$ +- 1.5 G, $^{19}a(3) = 194.5$ +- 0.5 G, and g = 2.014 +- 0.001. The C/sub 3v/ symmetry suggested by these results is supported by INDO calculations which indicate that this geometry is preferred to those of trigonal-bipyramidal (C/sub s/) structures. In contrast, theoretical calculations of the g factor provide no clear-cut basis for discriminating between these various structures. Evidence was obtained for the dissociation of F_3NO^- to F_2NO on annealing the SF_6 matrix through the phase transition at 94 K, and this reaction is interpreted with reference to the characteristics of the semioccupied molecular orbital of F_3NO^-. 4 figures, 2 tables.

27522 **Mechanism of disproportionation of ascorbate radicals.** Bielski, B.H.J.; Allen, A.O.; Schwarz, H.A. (Brookhaven National Lab., Upton, NY). *Journal of the American Chemical Society ;* **103**: No. 12, 3516-3518(17 Jun 1981).

Existing data on the kinetics of ascorbate radical decay, together with some new data on the effects of temperature, ionic strength, and presence of phosphate buffers, suggest a mechanism in which the ascorbate radical ion is in equilibrium with a dimer. This dimer reacts with hydrogen ion, or with other proton donors present including water and buffers (at rates depending upon their acid strengths), to form the disproportionation products ascorbate ion and dehydroascorbate acid.

27523 **Optically detected time-resolved electron paramagnetic resonance. Excited states and radical ion kinetics in pulse radiolysis of aromatics in cyclohexane solutions.** Smith, J.P.; Trifunac, A.D. (Argonne National Lab., IL). *Journal of Physical Chemistry ;* **85**: No. 12, 1645-1653(11 Jun 1981).

Excited-state production and radical ion recombination kinetics in pulse-irradiated solutions of aromatic solutes in cyclohexane were studied by a new method of optical detection of time-resolved electron paramagnetic resonance (EPR) spectra. The EPR spectra of radical ion pairs which recombine to yield excited solute singlets were detected by the resonant decrease in fluorescence intensity occurring after application of a single (30 to 500 ns) microwave pulse. Fluorescence detection of magnetic resonance (FDMR) was used to obtain EPR spectra of radical ion pairs with lifetimes between 0.02 and 1.4 μs at solute concentrations of 10^{-5} to 10^{-1}M. The decay rate of the FDMR intensity observed for 10^{-3} M solutions of 2,5-diphenyloxazole (PPO) was independent of radiation dose over a wide range of low doses but increased at high radiation doses. Analysis of the FDMR decay kinetics showed that the FDMR effect is a resonant modulation of the singlet yield of geminate ion recombination and suggested that a dose-dependent relaxation process contributes to the decay at high radiation doses. A short-lived component with a broad EPR line width was detected at PPO concentrations below 10^{-3} M. This finding suggested that the FDMR method could be used to distinguish between excited states produced by solute anion-solute cation and solute anion-solvent cation recombination reactions. The resolution of hyperfine components in the FDMR spectrum of 10^{-3} M biphenyl solutions was strongly dependent on microwave magnetic field and pulse length. The best resolution was obtained with microwave magnetic fields below 0.4 G and pulse widths in excess of 300 ns. The hyperfine structure of the EPR spectra of radical ions involved in excited-state production could be thus obtained by sacrificing some of the time resolution and sensitivity of the FDMR method.

27524 **Geometrical structure of solvated electrons in ethanol glass determined from electron spin echo modulation analyses.** Narayana, M. (Wayne State Univ., Detroit, MI); Kevan, L. Contract EY-76-S-02-2086. *Journal of the American Chemical Society ;* **103**: No. 7, 1618-1622(8 Apr 1981).

Two-pulse and three-pulse electron spin echo deuterium modulation patterns have been analyzed for radiation-produced solvated electrons in the following specifically deuterated ethanol glasses: CH_3CH_2OD, CH_3CD_2OH, and CD_3CH_2OH. The analyses are all consistent with four first-solvation-shell molecules around the electron with the CD_3 deuterons at 0.38 nm, the CD_2 deuterons at 0.33 nm, and the OD deuteron at 0.22 nm from the electron. The distances are compatible only with a molecular dipole orientation of the ethanol molecules with the bisector of the COD bond angle approximately oriented toward the electron. This contrasts with the OD bond dipole orientation found for solvated electrons in aqueous matrices.

4007 Radiochemistry And Nuclear Chemistry

REFER ALSO TO CITATION(S) 27478, 27724

27525 Evaporation-based Ge/^{68}Ga separation. Grant, P.M.; Mirzadeh, S.; O'Brien, H.A.; Whipple, R.E. (to Department of Energy). US Patent 4,248,730. 3 Feb 1981. Filed date 13 Sep 1979. vp.

Micro concentrations of ^{68}Ga in secular equilibrium with ^{68}Ge in strong aqueous HCl solution may readily be separated in ionic form from the ^{68}Ge for biomedical use by evaporating the solution to dryness and then leaching the ^{68}Ga from the container walls with dilute aqueous solutions of HCl or NaCl. The chlorogermanide produced during the evaporation may be quantitatively recovered to be used again as a source of ^{68}Ga. If the solution is distilled to remove any oxidizing agents which may be present as impurities, the separation factor may easily exceed 105. The separation is easily completed and the ^{68}Ga made available in ionic form in 30 minutes or less.

27526 XPS-AES characterization of plutonium oxides and oxide carbide. The existence of plutonium monoxide. Larson, D.T.; Haschke, J.M. (Rockwell International, Golden, CO). Contract AC04-76DP03533. *Inorganic Chemistry ;* **20**: No. 7, 1945-1950(Jul 1981).

The plutonium-oxygen phase diagrams has been clarified by XPS and AES results which show that three oxygen-containing plutonium phases, PuO_2, α-Pu_2O_3, and PuO/sub x/C/sub y/, are successively formed when oxide-coated plutonium metal is heated in vacuo to 500°C. Formation of the oxide carbide is evidenced by the fact that a shift in the Pu(4f/sub 7/2/) binding energy is coincident with changes in the C(1s) photoelectron and C(KLL) Auger spectra, showing that unbound carbon is converted to carbide. The reaction conditions duplicate those at which plutonium monoxide reportedly forms and demonstrate that the NaCl-type surface phase previously identified as PuO is actually PuO/sub x/C/sub y/. The oxide carbide has a spectroscopically determined composition of PuO/sub 0.65+-0.15/C/sub 0.45+-0.15/ and reacts with CO, CO_2, and O_2 at low pressures to form PuO_2 and unbound carbon in a coherent product layer (~ 20 nm thick) which retards further oxidation. Estimated thermodynamic data for PuO/sub x/C/sub y/ are consistent with the observed formation and oxidation reactions. The Pu(4f/sub 7/2/) binding energies for PuO_2, α-Pu_2O_3, PuO/sub x/C/sub y/, and Pu are 426.1, 424.4, 423.6, and 422.2 eV, respectively.

27527 Barriers to ring rotation in 1,1′,4,4′-tetra-tert-butyluranocene and 1,1′,3,3′-tetra-tert-butylferrocene. Luke, W.D.; Streitwieser, A. Jr. (Univ. of California, Berkeley). Contract W-7405-ENG-48. *Journal of the American Chemical Society ;* **103**: No. 12, 3241-3243(17 Jun 1981).

The ^{1}H NMR spectra of 1,1′,4,4′-tetra-tert-butyluranocene show a singlet for the tert-butyl protons and three singlets for the ring protons. Coalescence occurs at -65 to -85°C with splitting of each peak at lower temperatures, corresponding to ΔG^{++} of rotation of 8.3 kcal mol^{-1}. Coalescence was also observed for 1,1′3,3′-tetra-tert-butylferrocene and a corresponding ΔG^{++} = 13.1 kcal mol^{-1} was obtained. 4 figures, 2 tables.

27528 Specific sequestering agents for the actinides. VI. Synthetic and structural chemistry of tetrakis(N-alkylalkanehydroxamato)thorium(IV) complexes. Smith, W.L.; Raymond, K.N. (Univ. of California, Berkeley). Contract W-7405-ENG-48. *Journal of the American Chemical Society ;* **103**: No. 12, 3341-3349(17 Jun 1981).

Hydroxamate complexes of the actinides have been investigated as structural archetypes in the design of actinide-specific sequestering agents. The complexes $Th[(CH_3)_2CHN(O)O(O)R]_4$ have been prepared (R = $C(CH_3)_3$ (1) or $CH_2C(CH_3)_3$ (2) The uranium(IV) analogue of 1 was also prepared. The tert-butyl groups of 1 dominate the stereochemistry of the complex by assuming a tetrahedral disposition around the metal. The coordination polyhedron of 1, which has 4 (S_4) crystallographic symmetry, is nearly cubic. The localization of charge on the nitrogen oxygen of the hydroxamate group makes this ligand unsymmetrical, and this gives rise to a 0.14-A difference in R(Th-O/sub N/) [2.357(3) A] and R(Th-O/sub C/) [2.492 (3) A]. The sterically less constrained neopentyl derivative 2 shows a more typical eight-coordinate geometry - the D/sub 2d/ trigonal-faced (mmmm) dodecahedron. The average R(Th-O/sub N/) [2.36 (1) A] is again shorter than R(Th-O/sub C/) [2.46 (2) A]. There is apparently no sorting of sites by ligand charge, since the O/sub N/ and O/sub C/ atoms are equally distributed between the A and B sites of the dodecahedron. Crystals of 1 conform to space group $I4_1/a$ with a = 17.338 (4) A and c = 12.706 (4) A. For 4 formula units per cell the calculated density d/sub calcd/ is 1.50 g cm^{-3} and d/sub obsd/ is 1.50 (1) g cm^{-3}. Crystals of 2 conform to space group P1 with a = 9.777 (2) A, b = 14.633 (2) A, c = 18.515 (1) A, α = 74.061$_0$ (8), β = 88.41 (1)°, and γ = 74.71 (2)°. For 2 formula units per cell d/sub calcd/ = 1.30 g cm^{-3} and d/sub obsd/ = 1.19 g cm^{-3}. Full-matrix least-squares refinement of both structures using all averaged, independent data with $F^2 > 3\sigma(F)^2$ gave for 1 with 1798 data and 117 variables R = 0.027 and R/sub w/ = 0.032 and for 2 with 6978 data and 467 variables R = 0.034, R/sub w/ = 0.042. 10 figures, 11 tables.

27529 Siderophilin metal coordination. 1. Complexation of thorium by transferrin: structure-function implications. Harris, W.R.; Carrano, C.J.; Pecoraro, V.L.; Raymond, K.N. (Lawrence Berkeley Lab., CA). *Journal of the American Chemical Society ;* **103**: No. 9, 2231-2237(6 May 1981).

As part of a program to develop actinide-specific sequestering agents, the coordination of actinide ions by human transferrin is being investigated. Therapeutically useful synthetic ligands must be able to compete with this iron-transport protein for the bound actinide ion. As in the Fe(III) complex of the native protein, two Th(IV) ions bind at pH 7. This coordination has been monitored at several pH values by using difference ultraviolet spectroscopy. The corresponding coordination of a phenolic ligand, ethylenebis(o-hydroxyphenylglycine) (EHPG), has been used to determine $\Delta\epsilon$ upon protein coordination, the number of transferrin tyrosine residues that coordinate. Maxima in the Th(IV) + EHPG difference UV spectra occur at 292 and 238 nm, with corresponding $\Delta\epsilon$ values per phenolic group of 2330 and 8680 cm^{-1} M^{-1}, respectively. At pH 7.2, the Th(IV) transferring spectrum is closely similar to the Th/sup IV/EHPG spectrum, with maxima at 292 and 240 nm. The $\Delta\epsilon$ at 240 nm reaches a maximum of 24700 cm^{-1} m^{-1}, which corresponds to coordination of three tyrosine residues in the dithorium-transferrin complex; the stronger binding site (A or C-terminal) coordinates via two tyrosines and the weaker (B or N-terminal) via one. There is evidence suggesting that the N-terminal site is slightly smaller than the C-terminal site; while Th(IV) easily fit into both sites.s into the C-terminal site, the large ionic radius of Th(IV) makes this ion of borderline size to fit into the N-terminal site. This may be an important biological difference between Th(IV) and the slightly smaller Pu(IV), which should easily fit into both sites.

27530 Vapor pressure and thermodynamics of actinide metals. Ward, J.W. (Los Alamos Scientific Lab., NM); Kleinschmidt, P.D.; Haire, R.G.; Brown, D. Contract W-7405-ENG-48. *ACS (American Chemical Society) Symposium Series ;* No. 131, 199-220(1980).

Precise vapor pressure measurements by target collection/mass spectrometric Knudsen effusion techniques were combined with crystal entropy estimates to produce self-consistent free-enrgy

functions, permitting calculation of heats, entropies and free energies from 298°K to the highest temperatures of measurement. The vapor pressures and thermodyamics of vaporization of americium, curium, berkelium, and californium are compared in terms of electronic structure and bonding trends in the trans-plutonium elements. These resuslts are contrasted with the behavior of the early actinides, with attention to energy states and possible effects of f-electron bonding. 9 figures, 4 tables.

4008 Combustion, Pyrolysis, And High-temperature Chemistry

REFER ALSO TO CITATION(S) 26809

42 ENGINEERING

4202 Facilities And Equipment

REFER ALSO TO CITATION(S) 26805, 26833, 26893, 27185, 27186, 27940, 27985, 27986, 28001, 28005

27531 (BDX—613-2607) Simplified definition system: magnetic products fabrication. Morris, R.S. (Bendix Corp., Kansas City, MO (USA)). Jun 1981. Contract AC04-76DP00613. 20p. NTIS, PC A02/MF A01. Order Number DE81025521.

The Simplified Definition System, a product definition approach that differentiates between design and production agency manufacturing requirements, has been used in producing 50 types of magnetic products. This system was formed as a result of cooperative work and proposed modifications by engineers from Bendix Kansas City and Sandia National Laboratories Albuquerque (SNLA) to reduce product costs. The system places responsibility for production-related requirements with a production agency, a procedure that has realized both direct and indirect cost savings. This report is a documentation of the system's description and projected savings on magnetic products.

27532 (DOE/BC/10079—26) Experimental determination of solids friction factors and minimum volumetric requirements in air or gas drilling. Machado V, C.J.; Ikoku, C.U. (Tulsa Univ., OK (USA)). Nov 1980. Contract AC19-79BC10079. 223p. NTIS, PC A10/MF A01. Order Number DE81026604.

There are so many variables involved in an air or gas drilling situation that one general correlation has not been developed to predict appropriate volumetric requirements in the field. The results of previous attempts to calculate minimum volumetric requirement are valid over limited ranges of drilling conditions. This research has developed new empirical correlations for solids friction factors for sandstone, limestone, and shale. A new and more realistic technique for predicting minimum volumetric requirements is presented. This method includes a complete analysis of pressures throughout the system. It also offers flexibility in the selection of standpipe pressure and air flow rate, and thus, compressor specifications. The method is primarily graphical so that it can be used at the well site without access to a computer. Results are presented in tabular and graphical forms. These results confirm that existing methods may predict too low or too high a volumetric flow rate.

27533 (LA-UR—81-374) Extensions to a nonlinear finite-element axisymmetric shell model based on Reissner's shell theory. Cook, W.A. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 11p. (CONF-810801—14). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

Extensions to shell analysis not usually associated with shell theory are described in this paper. These extensions involve thick shells, nonlinear materials, a linear normal stress approximation, and a changing shell thickness. A finite element shell-of-revolution model has been developed to analyze nuclear material shipping containers under severe impact conditions. To establish the limits for this shell model, the basic assumptions used in its development were studied; these are listed in this paper. Several extensions were evident from the study of these limits: a thick shell, a plastic hinge, and a linear normal stress.

27534 (LA-UR—81-937) Experiment showing a mechanical manifestation of the helicity of transport current in superconducting wires. Overton, W.C. Jr.; Weinstock, H. (Los Alamos National Lab., NM (USA); Illinois Inst. of Tech., Chicago (USA)). 1981. Contract W-7405-ENG-36. 3p. (CONF-810809—4). NTIS, PC A02/MF A01.

From 16. international conference on low temperature physics; Los Angeles, CA, USA (19 Aug 1981).

The transport current density of the mixed state of type II wires will have the form J = z J/sub z/ + Θ J/sub Θ/ when the supercurrent exhibits a helical distribution due to the application of an external field H/sub z/. This is proved by the magnetic moment measurements of Walmsley and Timms, who observed the so-called paramagnetic component of moment M when J/sub Θ/ not equal to 0. A mechanical manifestation of the helical current was observed by combining a normal-zone propagation experiment with a capacitive technique for measuring mechanical torsion of the sample. Moreover, the torsion was observed even when H/sub z/ = 0, an effect that might be explained by the theory of Kondo and Kuroda on the helicity of transport currents in normal metals due to spiral dislocations.

27535 (LA-UR—81-1045) Can magnetic refrigerators liquefy hydrogen at high efficiency. Barclay, J.A. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 10p. (CONF-810804—6). NTIS, PC A02/MF A01.

From National heat transer conference; Milwaukee, WI, USA (2 Aug 1981).

A concept for a hydrogen liquefier based on the magnetocaloric effect is introduced. A second-law analysis of the general device is described. The calculation predicts that efficiencies ~ 50% of Carnot are probable. A brief comparison to gas refrigeration systems is made.

27536 (LBL—12450) dc SQUID near the quantum noise limit. Van Harlingen, D.J.; Koch, R.H.; Clarke, J. (Lawrence Berkeley Lab., CA (USA)). 1981. Contract W-7405-ENG-48. 6p. (CONF-810809—10). NTIS, PC A02/MF A01.

From 16. international conference on low temperature physics; Los Angeles, CA, USA (19 Aug 1981).

A series of dc SQUIDs has been fabricated in an attempt to obtain quantum-limited sensitivity. Typically, the SQUID inductance, L, is 2 pH, the capacitance and critical current of each tunnel junction are 0.5 pF and 0.5 mA, and the shunt resistance for each junction is 1Ω. The measured spectral density of the voltage noise S/sub v/ contains a 1/f component that extends typically to 100 kHz or higher. When the 1/f component is subtracted out, the best energy sensitivity achieved to date is ϵ/1Hz = S/sub v// 2L(delta V/delta PHI)^2 less than or approximately equal to 2h, where delta V/delta PHI is the transfer coefficient.

27537 (RFP—3056) Criticality alarm system for plutonium process operations. Tyree, W.H.; Urano, H. (Rockwell International Corp., Golden, CO (USA). Energy Systems Group). 25 May 1981. Contract AC04-76DP03533. 37p. NTIS, PC A03/MF A01. Order Number DE81026661.

A criticality alarm system using neutron detection is described. The system includes a neutron detection unit with an internal operational testing mode. The unit uses a Li^{6}F foil for the production of alpha particles from a thermal neturon flux, a thorium-230 alpha particle source for the continuous monitoring of the raidation detection circuits, and an internal clock which produces an alarmed condition if the detector amplifier circuit fails. This neutron detector unit is designed to replace the existing neutron detector in the criticality alarm systems at Rocky Flats. Coincidence circuits, interface system and audio signal generators used in the output of the alarm system are described. The system meets the criteria for the American National Standards and the USDOE Manual Chapter for detection, alarm, and signal output requirements.

27538 **(SAND—78-0458) Analysis, scale modeling, and full-scale test of a railcar and spent-nuclear-fuel shipping cask in a high-velocity impact against a rigid barrier.** Huerta, M. (Sandia National Labs., Albuquerque, NM (USA)). Jun 1981. Contract AC04-76DP00789. 60p. (TTC—0087). NTIS, PC A04/MF A01. Order Number DE81027296.

This report describes the mathematical analysis, the physical scale modeling, and a full-scale crash test of a railcar spent-nuclear-fuel shipping system. The mathematical analysis utilized a lumped-parameter model to predict the structural response of the railcar and the shipping cask. The physical scale modeling analysis consisted of two crash tests that used 1/8-scale models to assess railcar and shipping cask damage. The full-scale crash test, conducted with retired railcar equipment, was carefully monitored with onboard instrumentation and high-speed photography. Results of the mathematical and scale modeling analyses are compared with the full-scale test. 29 figures.

27539 **(SAND—80-2049/1) Instruction manual for Sandia's laser tracker. Volume 1.** Bauhs, K.C. (Sandia National Labs., Albuquerque, NM (USA)). Jun 1981. Contract AC04-76DP00789. 83p. NTIS, PC A05/MF A01. Order Number DE81027521.

A compilation of informal notes and sketches of original and modified subsystems of the Laser Tracker System (LTWS) from 1968 to 1974 is presented. Revisions and additions to the system from 1977 to 1980 are included. The system uses an argon laser.

27540 **(SAND—81-0742) Image-processing facility for Sandia National Laboratories, Albuquerque.** Ghiglia, D.C. (Sandia National Labs., Albuquerque, NM (USA)). Jun 1981. Contract AC04-76DP00789. 9p. NTIS, PC A02/MF A01. Order Number DE81025909.

An image processing facility is being developed at Sandia National Laboratories, Albuquerque, to support a wide and continually changing variety of image processing, signal processing, and pattern recognition tasks. This report addresses the hardware and software capabilities, current and planned image processing activities, development philosophy, and some of the factors leading to the development of this facility.

27541 **(SAND—81-1369C) Analysis of capsules for recovery of shock-compressed matter.** Davison, L.; Webb, D.M.; Graham, R.A. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 10p. (CONF-810684—26). NTIS, PC A02/MF A01. Order Number DE81023687.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

There are many circumstances in which it is desirable to recover matter that has been subjected to compression by a strong shock wave. In most cases this necessitates designing an encapsulation device that ensures that the material is processed by the shock in the most uniform way possible and is protected from the aftereffects of the explosion or impact producing the shock. For scientific purposes, it is necessary that the conditions to which the material has been subjected be known. Calculation is necessary for both designing sample recovery capsules and inferring the conditions to which the sample material has been subjected. Means for performing these calculations are discussed, along with their strengths and limitations, and some results for a particular configuration of interest are presented.

4203 Lasers

REFER ALSO TO CITATION(S) 27539

27542 **Passively mode-locked Nd:glass laser oscillator optimized for TEM_{00} selectivity and long term stability and reliability.** George, S.M.; Harris, C.B. (Department of Chemistry and Materials and Molecular Research Division of Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Review of Scientific Instruments ;* **52**: No. 6, 852-857(Jun 1981).

A passively mode-locked Nd:glass laser oscillator optimized for TEM_{00} selectivity and long term stability and reliability is presented. The important aspects of the optimized design are explained in detail. A detailed alignment procedure is also included. This laser oscillator is capable of producing TEM_{00}, bandwidth-limited, ≅9 picosecond pulses for > or =12 hours.

27543 **(DOE/ER/13581—T1) Synthesize and evaluate laser dyes for LASL. Final report.** Nowlin, D.K. (New Mexico Univ., Albuquerque (USA)). [nd]. Contract AS04-76ER13581. 99p. NTIS, PC A05/MF A01. Order Number DE81023284.

Properties of materials for use in flashlamp-pumped dye lasers are tabulated. 87 dyes were studied. The absorption spectra and the fluorescence spectra under pulsed N_2 laser excitation are presented for each compound. Also presented are the Stokes shift, quantum efficiency for fluorescence, fluorescence lifetime, and concentration dependence of laser power for each compound. (WHK)

4204 Heat Transfer And Fluid Flow

REFER ALSO TO CITATION(S) 27562

27544 **(SAND—80-2614C) New correlation theory for steady natural-convective heat-transport data for horizontal annuli.** Boyd, R.D. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 28p. (CONF-810804—2). NTIS, PC A03/MF A01.

From National heat transer conference; Milwaukee, WI, USA (2 Aug 1981).

A correlation theory, for two-dimensional natural convective heat transport data for horizontal annuli of arbitrary cross section, has been developed and applied to two configurations: (1) concentric cylinders and (2) an annulus formed by an inner hexagonal cylinder and an outer circular cylinder. Also embodied in the theory is the capability to predict the local and mean heat transfer. Thermal boundary conditions of the form T'x/sup m/ can be accommodated. Data for the Rayleigh number (Ra/sub R/) varied from 10 to 10^7, Prandtl number (Pr) varied from 0.7 to 3100, and the aspect ratio (Δ'/r', maximum annulus gap/minimum radius of inner annulus) varied from 0.125 to 2.0. Even with these large variations, the present correlation theory collapses all the experimental data for the annular geometries to a single line. This work demonstrates that the present theory is applicable to annuli of arbitrary cross-section. Therefore, the physical problem appears to be completely specified by a single equation when the following is known: thermal boundary condition (i.e., m), the fluid (i.e., Pr), the aspect ratio, and the Rayleigh number.

27545 **Fractional step methods for thermohydraulic calculation.** Stewart, H.B. (Applied Mathematics Department, Brookhaven National Laboratory, Upton, New York 11973). Contract DE-AC02-76CH00016;ET-78-C-02-4687. *Journal of Computational Physics ;* **39**: No. 3, 77-90(1 Mar 1981).

A method of fractional steps is used to extend a semi-implicit finite-difference technique for multidimensional two-phase flow calculations. This extension permits time step size to be chosen independent of convection velocities in one space direction, and still resolves multidimensional coupled sonic and phase exchange effects implicitly by forming a simple Poisson problem for pressure. Because pure time-splitting by physical phenomena was found unsuited to thermal hydraulics problems, a stabilizing corrections method was chosen. An application in nuclear safety analysis is demonstrated.

4205 Materials Testing

REFER ALSO TO CITATION(S) 27359, 27387, 27410

27546 **(LA-UR—81-1734) New techniques and phenomena at multimegabar dynamic pressures.** Shaner, J.W. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 7p. (CONF-810640—2). NTIS, PC A02/MF A01. Order Number DE81025405.

From 17. State-of-the-art symposium; Washington, DC, USA (8 Jun 1981).

At pressures beyond the range of contemporary diamond anvil technology, we expect a wealth of unexplored changes in the properties of materials, such as the appearance of new solid phases and large increases in melting temperatures. From a practical standpoint, multi-megabar pressures still require dynamic compressions because of the difficulty of containing a very high energy-density. Shock waves have been a convenient way of producing fairly well-defined material states at multi-megabar pressures. However, the rapid temperature rise associated with strong shocks has obscured some of the interesting material behavior. On the other hand, the temperature rise makes shock wave techniques ideal for studying melting phenomena at very high pressures. By accurately measuring the velocity of sound in a shock compressed medium, we effectively obtain a derivative of the equation-of-state surface. In addition to this new information, the sound velocity is sensitive to changes of state. Another sensitive detector of phase changes is the temperature behind a shock front. By measuring temperatures and sound velocities we have been able to detect previously unmeasured solid-solid and melting transitions.

4206 Safety Engineering

REFER ALSO TO CITATION(S) 27537

4208 Electronic Circuits And Devices

REFER ALSO TO CITATION(S) 27616, 27617, 28017, 28021

27547 (LA-UR—81-1249) Critical pulse power components. Sarjeant, W.J.; Rohwein, G.J. (Los Alamos National Lab., NM (USA); Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract W-7405-ENG-36. 17p. (CONF-810812—9). NTIS, PC A02/MF A01.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

Critical components for pulsed power conditioning systems will be reviewed. Particular emphasis will be placed on those components requiring significant development efforts. Capacitors, for example, are one of the weakest elements in high-power pulsed systems, especially when operation at high-repetition frequencies for extended periods of time are necessary. Switches are by far the weakest active components of pulse power systems. In particular, opening switches are essentially nonexistent for most applications. Insulaton in all systems and components requires development and improvement. Efforts under way in technology base development of pulse power components will be discussed.

27548 (LA-UR—81-1553) Stripline magnetic modulators for lasers and accelerators. Nunnally, W.C. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 5p. (CONF-810659—17). NTIS, PC A02/MF A01. Order Number DE81025258.

From 3. IEEE international pulsed power conference; Albuquerque, NM, USA (1 Jun 1981).

The basics of magnetic modulators including magnetic element and circuit considerations as applied to accelerators and lasers requiring repetitive (1 to 10 kHz), high voltage (50 to 500 kV), short pulse (50 to 100 ns) are discussed. The scaling of energy losses and switching parameters with material are included.

27549 (LA-UR—81-1666) Field grading in capacitor margins. Springer, T.E.; Sarjeant, W.J.; Nunnally, W.C. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 5p. (CONF-810659—12). NTIS, PC A02/MF A01. Order Number DE81025381.

From 3. IEEE international pulsed power conference; Albuquerque, NM, USA (1 Jun 1981).

Some of the results of modeling electric fields in the margin of a bogey plastic film liquid impregnant capacitor are presented where effects of foil edge shape, different impregnants, and grading wires are examined. It is concluded that placement tolerance and connection problems make grading wires impractical and that folded foil edges are still the best solution to field grading. (WHK)

27550 (LA-UR—81-1670) Blumlein line generation of long-pulse, precisely regulated waveshapes for nonlinear resistive loads. Reass, W.A. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 4p. (CONF-810659—14). NTIS, PC A02/MF A01. Order Number DE81025380.

From 3. IEEE international pulsed power conference; Albuquerque, NM, USA (1 Jun 1981).

This paper describes the criteria utilized in the design of a long-pulse, offset-tuned Blumlein line. It is capable of 100-μs, medium repetition rate (lkC), 200-kV pulses for nonlinear loads (such as klystrons), with a total power deviation of less than 0.5% (ripple, overshoot, and droop, inclusive).

27551 (SAND—81-1378C) Hardware implementation of a discrete-time analog adaptive filter. Donohoe, G.W. (Sandia National Labs., Albuquerque, NM (USA); New Mexico Univ., Albuquerque (USA)). 1981. Contract AC04-76DP00789. 5p. (CONF-810623—10). NTIS, PC A02/MF A01. Order Number DE81025403.

From 24. midwest symposium on circuits and systems; Albuquerque, NM, USA (29 Jun 1981).

This paper describes a hardware implementation of a discrete-time adaptive filter using a bucket-brigade device (BBD) tapped analog delay line, analog voltage multipliers and operational amplifier integrators and summing circuits. Some design considerations for this class of circuits are discussed.

27552 (SAND—81-1579C) Tutorial on design, fabrication, and testing of custom CMOS ICs. Gwyn, C.W. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 58p. (CONF-810707—3). NTIS, PC A04/MF A01. Order Number DE81026984.

From IEEE conference on nuclear science and space radiation; Seattle, WA, USA (21 Jul 1981).

The IC design and fabrication process is outlined. Testing concerns are listed and the various types of tests required for qualifying high reliability circuits are listed. Several comments are included regarding circuit testing after exposure to a radiation environment. Finally, some radiation effects data are presented for the production of radiation hard silicon gate CMOS circuits, and the methods used to estimate component or circuit life are summarized. A short overview of the goals and objectives for the Center for Radiation-Hardened Microelectronics is given.

27553 (UCID—19077) Automatic test system for CCDs. McConaghy, C.F. (Lawrence Livermore National Lab., CA (USA)). Jun 1981. Contract W-7405-ENG-48. 8p. NTIS, PC A02/MF A01. Order Number DE81025888.

This report describes an automatic test system for measuring the AC characteristics of charge coupled devices (CCD). The purpose of this system is to increase throughput and to remove the necessity of having an operator present to make numerous tedious measurements. The test system measures the diffusion voltage at which charge first injects into the CCD. In addition, it measures the output amplitude in millivolts corresponding to a full well condition as well as the input diffusion voltage corresponding to this condition. Finally, it returns the value of charge transfer efficiency (CTE) when biased at full well so a decision can be made whether a particular CCD channel is good or bad. The system is currently set up to measure a five channel linear CCD, but can easily be adapted to handle any number of channels including a four channel SPS CCD. Each CCD channel is characterized separately.

27554 (UCID—19080-80) Engineering Research Division publication report, calendar year 1980. Miller, E.K.; Livingston, P.L.; Rae, D.C. (eds.). (Lawrence Livermore National Lab., CA (USA)). Jun 1980. Contract W-7405-ENG-48. 75p. NTIS, PC A04/MF A01. Order Number DE81025885.

Each year the Engineering Research Division of the Electronics Engineering Department at Lawrence Livermore Laboratory has issued an internal report listing all formal publications produced by the Division during the calendar year. Abstracts of 1980 reports are presented.

27555 **Minicomputer-based test system for analyzing the electronic components of a large scale scientific research instrument.** Pecina, R.J.; Travis, D.J.; Guercio, J.S.; Hedtke, P.A. (Electronics Division, Argonne National Laboratory, Argonne, Illinois 60439). Contract W-31-109-ENG-38. *Review of Scientific Instruments ;* **52**: No. 6, 915-921(Jun 1981).

Large scale research experiments often require the use of highly specialized and sophisticated electronic equipment including computer-based data acquisition systems capable of gathering large amounts of data over very short time intervals. Equipment malfunctions can mean a loss of experimental data integrity and valuable research time. A diagnostic test system has been developed to monitor the electronic equipment of such an experiment, the Fast Neutron Hodoscope at the Transient Reactor Test Facility in Idaho. The system allows hodoscope electronics designers at Argonne National Laboratory in Illinois, and hodoscope maintenance engineers in Idaho, to observe simultaneously digital and analog signals from the hodoscope electronics while the hodoscope is in operation. The diagnostic test system can be controlled either locally by the engineers at the research site in Idaho or remotely by the designers in Illinois via a computer to computer telephone link between the two sites. As a result potential equipment problems as well as actual failures can often be pinpointed and corrected with minimal lost time and cost to the research program.

27556 **Generation and measurement of dc electric fields with space charge.** Misakian, M. (Electrosystems Division, National Bureau of Standards, Washington, D.C. 20234). *Journal of Applied Physics ;* **52**: No. 5, 3135-3144(May 1981).

Characterization of the electrical environment in the vicinity of high voltage dc transmission lines requires measurement of a number of electrical parameters associated with the lines. These parameters include the electric field strength with significant space-charge contributions. This report describes an experimental effort to generate known dc electric fields containing controlled amounts of space charge. An apparatus which has been built for this purpose is described, and two types of field probes currently used for transmission line field measurements are examined with the apparatus. Limitations on the operation of one type of probe in the presence of very large current densities are identified and discussed.

4210 Combustion Systems

REFER ALSO TO CITATION(S) 26734, 26735, 26736, 26789, 26811, 26812, 27112, 27113, 27114, 27115, 27116, 27117, 27118, 27119, 27121, 27122, 27123, 27124, 27125, 27126, 27127, 27128, 27564, 27640

27557 **(DOE/CS/40028—T1) Use of stack air in production cupolas and the transfer of the technology in the foundry industry. Annual technical progress report, January 1-December 31, 1980.** (Pennsylvania State Univ., University Park (USA)). 1980. Contract AS02-76CS40028. 6p. (COO—2840-2). NTIS, PC A02/MF A01. Order Number DE81025634.

During the calendar year 1980 progress was made on the field demonstration of the stack air device applied to production cupolas. Two stack air devices were designed, installed, and preliminary tests were undertaken. The basic design for the third installation was completed. Production slow downs delayed one installation and the second installation was completed on a large cupola to control puffing. The testing program on all installations will be carried out in 1981 as called for in the contract. It is expected that the project can be brought to a successful conclusion within the next year.

27558 **(DOE/MC/11284—166) NO/sub x/ emission from combustors: a state-of-the-art review.** Chen, G.T.; Shang, J.Y.; Wen, C.Y. (West Virginia Univ., Morgantown (USA)). May 1981. Contract AM21-79MC11284. 95p. NTIS, PC A05/MF A01. Order Number DE81026231.

The state-of-the-art of the theory and control of NO/sub x/ emissions from combustors is reviewed including the mechanisms and kinetics of the formation of thermal and fuel NO/sub x/, its destruction by reactions with char and reducing gases, and NO/sub x/ emissions control technology and mathematical modeling of fluidized-bed combustors. Practical conclusions are drawn, some unsolved problems are described, and recommendations are made as to various topics which require further study.

27559 **(DOE/MC/14129—172) Pressurized fluidized bed-combustion part-load behavior. Volume II. Test 1 results.** Roberts, A.G.; Pillai, K.K.; Raven, P.; Wood, P. (National Coal Board, Leatherhead (UK). Coal Utilization Research Lab.). Oct 1980. Contract AC21-80MC14129. 93p. NTIS, PC A05/MF A01. Order Number DE81025924.

The program comprises three tests concerned with operation at part load and under the transient conditions involved in load following. The three tests are complementary, each one consisting of operation at many different conditions, and overall comment on the results cannot be made until all the tests have been completed. Details and results from the first test are presented. Operation was at the following conditions: (1) high bed temperature (1630°F) and deep bed (9 ft); (2) low bed temperature (1420°F) and deep bed (9 ft); and (3) low bed temperature (1460°F) and shallow bed (4 ft). Other parameters - fluidizing velocity, excess air and pressure were maintained constant at 4 ft/s, 50% and 75 psig, respectively. Temperature distribution within the bed was substantially uniform at all conditions. Combustion efficiency was 99% at condition (1), falling to 98% at condition (3) and 96-1/2% at condition (2), i.e., there was a reduction in combustion efficiency at part load. Sulfur retention similarly fell at part load conditions, from 93-1/2% at condition (1) to 87% at condition (2), and 86% at condition (3) (all at a Ca/S of 1.6 to 1.7). NO/sub x/ emissions were about 0.30 lb/10^6 Btu. (WHK)

27560 **(DOE/MC/14129—173) Pressurized fluidized-bed combustion. Volume III. Test 2 results.** Roberts, A.G.; Pillai, K.K.; Raven, P.; Wood, P. (National Coal Board, Leatherhead (UK). Coal Utilization Research Lab.). Feb 1981. Contract AC21-80MC14129. 99p. NTIS, PC A05/MF A01. Order Number DE81025923.

This report presents details and results from a test on a pressurized fluidized-bed combustor which was concerned with: demonstrating that load can be changed at a suitable rate in a PFBC by changing the bed height and thus altering the ratio of cooled surface between the bed and the freeboard; and operating at 1400°F bed temperature and a bed depth of 6 ft, with and without cooling in the freeboard at a fluidising velocity, excess air and pressure of 4 ft/s, 50% and 75 psig, respectively. Most of the test was concerned with transferring bed material to-and-from a storage vessel at controlled but varying rates and at different bed temperatures. Bed levels were changed at rates of between 0.2 and 0.5 ft/min with no untoward excursions in gas composition. The most stringent conditions existed when changing bed temperature and pressure at the same time as changing bed level. It was concluded that changing load in this manner in a commercial unit would be a practical possibility. While changing bed height, heat transfer coefficients to cooled tubes in the splash zone were measured. The combustion efficiency was 97% without freeboard cooling, and 96% with freeboard cooling. Sulphur retention was about 71% at a Ca/S ratio of 1.4. NO/sub x/ emission was about 0.35 lb/10^6 Btu. Elutriation from the combustor was about 19,000 ppM of dust, considerably higher that in a previous test, because the dolomite contained many more fines than in Test 1. Response rate measurements were made. Other data given in the report deal with alkali emissions and the performance of the gas cleaning equipment.

27561 **(DOE/MC/14129—174) Pressurized fluidized-bed combustion part-load behavior. Volume IV. Test 3 results.** Roberts, A.G.; Pillai, K.K.; Raven, P.; Wood, P. (National Coal Board, Leatherhead (UK). Coal Utilization Research Lab.). Mar 1981. Contract AC21-80MC14129. 64p. NTIS, PC A04/MF A01. Order Number DE81025921.

This report presents details and results from the third and final test on a pressurized fluidized-bed combustor. Operation was at the following conditions: (1) high bed temperature (1630°F) and shallow bed (4 ft) with a cooled freeboard; (2) low bed temperature (1380°F) and shallow bed (4 ft) with a cooled freeboard, at a fluidizing velocity of 2.5 ft/s; and (3) high bed temperature (1650°F) and deep bed (9 ft) with a single coal nozzle. This was not strictly a part load condition, but was carried out as a link with future programmes which involve combustion of run of mine coal using a

single feed point. Other parameters: fluidizing velocity (except in 2), excess air, and pressure were maintained constant at 4 ft/s, 50% and 75 psig, respectively. Temperature distribution within the bed was substantially uniform at conditions 1 and 2. Combustion efficiency was 96% at condition 1; 95 1/2% at condition 2 and 99% at condition 3. Sulphur retention was about 79% (Ca/S ratio = 1.6); 92% (Ca/S ratio = 2.35) and 96 1/2% (Ca/S ratio = 2.05) at conditions 1, 2, and 3, respectively. NO/sub x/ emissions were about 0.4 lb/10^6 Btu in Sections 1 and 3, rising to 0.54 lb/10^6 Btu in Section 2. Elutriation from the combustor was about 18,000 to 19,000 ppM of dust. The amount of coal ash elutriated was high (85 to 100%) at all conditions, but the amount of dolomite elutriated fell from 65% to 34% at the low velocity condition. Response rate measurements were made at conditions 1, 2, and 3 by sinusoidally varying the speed of the rotary coal feed valves. For these conditions the time constants were 280, 450 and 700 s. Other data deal with alkali emissions, the performance of the gas cleaning equipment, and the high temperature valve.

27562 **(DOE/MC/14322—168) Fluid dynamics of a fluidized bed packed with heat exchangers. Final report.** Zakkay, V.; Miller, G.; Kolar, A. (New York Univ., NY (USA)). Apr 1981. Contract AS21-80MC14322. 239p. NTIS, PC A11/MF A01. Order Number DE81025982.

Two fluidized bed facilities were built, and tests were conducted. Initially, a one-foot gas fired fluidized bed (GFFB) was built to study the bed dynamics and its interrelation with the heat transfer characteristics of immersed heat exchangers of different configurations. The GFFB, capable of achieving different gas velocity distributions in the bed with the help of a specially designed gas distributor, was operated to gain useful information on the influence of various operating parameters, such as the superficial gas velocity and its profile, the bed temperature (200°F to 700°F) and pressure (1 to 7 atm), and settled bed height (21″ to 55″), on the bed expansion and heat transfer characteristics of vertical and horizontal tube bundles, and an inverted U-tube. Tests were also performed on an inverted U-tube with longitudinal fins, and two unfinned inverted U-tubes to study the effect of heat exchanger solidity (8% to 16%). Particle attrition studies were also performed at atmospheric pressure. A one-foot, coal-fired fluidized bed was also built and initial tests were performed. Typical heat transfer and particle attrition data were collected with a single verticle tube heat exchanger axially located in the bed. The behavior of deep and shallow beds, as observed in the GFFB, was confirmed. This report documents the tasks accomplished on the GFFB and the one-foot CFFB during the DOE contract period, February 1978 to August 1980.

4240 Pollution Control Equipment

REFER ALSO TO CITATION(S) 27111, 27128, 27640

27563 **(DOE/MC/14058—T1) Integrated particle sizing system. Draft final report.** Poon, C.C.; Houser, M.J.; Bachalo, W.D. (Spectron Development Labs., Inc., Costa Mesa, CA (USA)). Apr 1981. Contract AC21-80MC14058. 37p. NTIS, PC A03/MF A01. Order Number DE81027123.

The new Integrated Particle Sizing system (IPSS Model 100) has been constructed with substantial improvements in the optical, mechanical, and electronic designs. The new system is simple to operate and remains stable over a long period of operation. Results of a continuous 100-hour monitoring of particulate from the combustion of pulverized coal using this system is presented.

27564 (EPRI-WS—79-220(Vol.2), pp 930-972) **Combustion modification environmental assessment.** Castaldini, C.; Evans, R.M.; Higginbotham, E.B.; Lim, K.J.; Mason, H.B.; Waterland, L.R. (Acurex Corp., Mountain View, CA). May 1981. NTIS, PC A17/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

The Combustion Modification Environmental Assessment (CMEA) was started in 1976 as part of the Environmental Protection Agency's (EPA) Conventional Combustion Environmental Assessment Program. The primary CMEA objectives are to: identify potential multimedia environmental hazards from stationary combustion sources before and after the use of combustion modifications to control NO/sub x/ and other combustion-related pollutants; develop combustion modification application guidelines documenting the economic, energy, operational and environmental impacts of meeting prescribed emission levels; and identify the most cost-effective and environmentally acceptable combustion modification techniques to achieve and maintain environmental goals for NO_2. To support these objectives, the emphasis in the CMEA is on field tests to quantify changes in emissions, energy efficiency, and operation due to the use of combustion modifications. The field testing uses the EPA environmental assessment Level 1 protocol which includes sampling and analysis for NO/sub x/, SO_2, SO_3, CO, CO_2, O_2, trace metals, organics, and trace inorganic species. During the first 3 years of the CMEA, field tests were done on three utility boilers, two industrial boilers, a gas turbine, and a residential warm air furnace. Each source was either modified in the field for low NO/sub x/ operation or was equipped with low NO/sub x/ designs. Test results showed no major increase in emissions due to combustion modification. Changes in emissions other than NO/sub x/ were typically within the accuracy of the experimental methods, or within the range of changes due to day-to-day variations in fuel composition or unit operation. Changes in the severity to the environment of total source effluents was secondary to the improvement due to NO/sub x/ reduction. Energy efficiency was generally unimpared or improved through the use of combustion modifications.

43 PARTICLE ACCELERATORS

4301 Design, Development, And Operation

REFER ALSO TO CITATION(S) 27994

4302 Beam Dynamics, Field Calculations, And Ion Optics

27565 **(LA—8808-MS) Comparison of measured emittance of an H^- ion beam with a simple theory.** Allison, P.; Sherman, J.D.; Smith, H.V. Jr. (Los Alamos National Lab., NM (USA)). Jun 1981. Contract W-7405-ENG-36. 13p. NTIS, PC A02/MF A01. Order Number DE81026684.

Ion beam phase space is frequently modeled with a simple theory having a few parameters; for example, the Kapchinskii-Vladimirskii (K-V) equations. For a real beam the normalized phase-space density $\partial^2 i/\partial x\, \partial$ in one transverse plane x, averaged over the other plane y, is usually far from that of a K-V distribution. We develop a simple theory based on plasma ion temperature that under some conditions gives a good description of the measured emittance of our H^- ion beam at about 15 keV.

27566 **(LA-UR—81-780) Four-dimensional beam tomography.** Minerbo, G.N.; Sander, O.R.; Jameson, R.A. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 4p. (CONF-810314—105). NTIS, PC A02/MF A01.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

A computer code has been developed to reconstruct the 4-D transverse phase-space distribution of an accelerator beam from a set of linear profiles measured at different angles at three or more stations along the beam line. The code was applied to wire-scan data obtained on the low-intensity H^- beam of the LAMPF accelerator. A 4-D reconstruction was obtained from 10 wire-scan profiles; 2-D projections of the reconstruction agree fairly well with slit-and-collector measurements of the horizontal and vertical emittance distributions.

27567 **(UCRL—85652) Physics of a repetitively pulsed 10 kAmp electron beam accelerator.** Fessenden, T.J.; Atchison, W.A.; Birx, D.L.; Briggs, R.J.; Clark, J.C.; Hester, R.E.; Neil, V.K.; Paul, A.C.; Rogers, D. Jr.; Struve, K.W. (Lawrence Livermore National Lab., CA (USA)). 1981. Contract W-7405-ENG-48. 9p. (CONF-810620—5). NTIS, PC A02/MF A01. Order Number DE81024416.

From 4. international topical conference on high-power electron and ion-beam research and technology; Palaiseau, France (29 Jun 1981).

Some aspects of physics that contributed to design and operation of the ETA 10 kAmp electron accelerator are discussed. These include: the electron source, the emittance growth in the injector, beam transport through the accelerator, and the influence of the beam breakup accelerator instability.

4303 Auxiliaries And Components

27568 **Exploitation of nonlinear growth of betatron oscillations to obtain efficient slow extraction from the AGS.** Weisberg, H.; Glenn, J.W. (Brookhaven National Lab., Upton, NY (USA)). *Nuclear Instruments and Methods ;* **169**: No. 3, 319-326(Mar 1980).

Nonlinear effects in resonant slow extraction from a synchrotron are such that a displacement in angle by means of a thin septum deflector can result in a displacement in position an integral number of betatron wavelengths downstream. This fact is exploited in the choice of location for an electrostatic septum to improve the extraction efficiency of the Brookhaven AGS. A curved septum, operating at 80 kV cm^{-1}, is used. The extraction efficiency is measured by a loss monitor technique. The measured efficiency is 97%, compared with 85% without the electrostatic septum.

27569 **(ANL-HEP-PR—81-05) Investigation of polarized-proton target materials by differential calorimetry: preliminary results.** Hill, D.A.; Hill, J.J. (Argonne National Lab., IL (USA)). 15 Oct 1980. Contract W-31-109-ENG-38. 68p. NTIS, PC A04/MF A01. Order Number DE81024456.

A simple differential calorimeter was designed and operated for an investigation of the thermodynamic properties of polarized target materials. The calibration and use of the calorimeter are discussed, after a brief exposition of our motivation for this work. The results of a preliminary study of target materials is presented with emphasis on the relevance of the glass state to dynamic polarization in chemically-doped targets.

27570 **(BNL—29613) Summary report on large HVEC accelerators.** Thieberger, P. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 7p. (CONF-810468—8). NTIS, PC A02/MF A01. Order Number DE81025109.

From 3. international conference on electrostatic accelerator technology; Oak Ridge, TN, USA (13 Apr 1981).

The main features are described of the ten presently operating large HVEC tandem accelerators and of four additional HVEC accelerators which are in different stages of testing, construction or planning. Present performance characteristics are discussed as well as available information about long term reliability. Some recent improvements are mentioned and comparisons are drawn for acceleration tube gradients in various different configurations and accelerators. Finally, some possible future developments are indicated.

27571 **(BNL—29647) Axial field spectrometer at the CERN ISR.** Gordon, H.; Hogue, R.; Killian, T. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 20p. (CONF-810351—4). NTIS, PC A02/MF A01. Order Number DE81024382.

From INS meeting on nuclear radiation detectors; Tokyo, Japan (23 Mar 1981).

The Axial Field Spectrometer (AFS) was recently brought into operation at the CERN ISR. It is being exploited in a wide-ranging program to study different aspects of those proton-proton or proton-antiproton collisions which are characterized by a large transverse momentum (p/sub T/). Examples include the measurement of inclusive distributions of identified high p/sub T/ hadrons, and the study of event structures characterized by a large transverse energy (E/sub T/) or the production of one or several high-p/sub T/ electrons or photons. The experimental approach to this program emphasizes integration of advanced magnetic spectroscopy with state-of-the-art calorimetry. These techniques are fully exploited to provide maximal information on all particles produced. In addition, information from these detectors is used in new ways for on-line event triggering and filtering; this allows even very rare events to be selected with high efficiency, an essential prerequisite for studies at a high-luminosity hadron collider, such as the ISR. Considerable modularity of the detectors was sought. Apart from clear advantages of construction, debugging, running, and servicing of such components, modularity provides ease for addition or reconfiguration of the system to emphasize the study of specific final states. At present, for example, a 1 sr Cerenkov detector system allows hadron identification up to $p \simeq 12$ GeV/c; liquid-argon electromagnetic calorimeters and a uranium-scintillator calorimeter (Hexagon) are used for a study of events containing direct photons.

27572 **(CONF-8009156—1) Design objectives for a GeV C.W. electron accelerator.** Cho, Y.; Holt, R.J.; Jackson, H.E.; Khoe, T.K.; Mavrogenes, G. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 3p. NTIS, PC A02/MF A01. Order Number DE81023890.

From Symposium on perspectives in electro-and photo-nuclear physics; Saclay, France (29 Sep 1980).

Design objectives are proposed for a continuous beam 2 GeV electron accelerator. Various accelerator concepts are examined in light of these requirements. A double-sided microtron shows promise for yielding major savings in capital cost and excellent beam characteristics.

27573 **(LA-UR—81-1817) Los Alamos National Laboratory Weapons Neutron Research Facility.** Woods, R. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 20p. (CONF-8106120—2). NTIS, PC A02/MF A01. Order Number DE81025312.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

The Weapons Neutron Research (WNR) spallation neutron source utilizes 800-MeV protons from the Los Alamos Meson Physics linac. The proton beam transport system, the target systems, and the data acquisition and control system are described. Operating experience, present status, and planned improvements are discussed.

27574 **(LBL—12268) Liquid-film stripper for high-intensity heavy-ion beams.** Leemann, B.T.; Merrill, P.; Syversrud, H.K.; Wada, R.; Yourd, R.B. (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 4p. (CONF-810314—164). NTIS, PC A02/MF A01. ORDER NUMBER DE81023031. Order Number DE81023031.

From Particle accelerator conference; Washington, DC, USA (11 Mar 1981).

Electron strippers are widely used in heavy ion accelerators such as tandem Van de Graaff generators and heavy ion linacs. The SuperHILAC at Lawrence Berkeley Laboratory, employs a fluorocarbon oil vapor stripper at 113 keV/A for its high intensity injector ABEL, while after acceleration to 1.199 MeV/A a 35 $\mu g/cm^2$ carbon foil stripper is used. At present, the lifetime of these foils is about 1 hour for an ^{40}Ar beam of $\sim$ 1 μA average particle current. With higher intensity high mass ($100 \leqq A \leqq 238$) beams available from ABEL injector the lifetime is expected to drop drastically and might be as low as one minute. A different approach to solve the stripper foil lifetime problem uses a thin free standing oil film spun from the edge of a sharp-edged rotating disc touching the surface of an oil reservoir. Areas of about 10 cm^2 with areal densities down to 20 $\mu g/cm^2$ have been reported. The work described here is based on the same concept, and produces a constantly regenerated, stable, free standing oil film of appropriate thickness for use at the SuperHILAC.

27575 **(LBL—12846) Early days of accelerator mass spectrometry.** Alvarez, L.W. (Lawrence Berkeley Lab., CA (USA)). May 1981. Contract W-7405-ENG-48. 16p. (CONF-810586—2). NTIS, PC A02/MF A01. Order Number DE81025317.

From Argonne symposium on high energy spectrometry; Argonne, IL, USA (11 May 1981).

Alvarez reviews his role in the development of the tandem Van de Graaff accelerator and the technique of accelerator mass spectrometry as a technique for isotope dating. (GHT)

27576 (SLAC-PUB—2723) Microprocessors in physics experiments at SLAC. Rochester, L.S. (Stanford Linear Accelerator Center, CA (USA)). Apr 1981. Contract AC03-76SF00515. 10p. (CONF-810539—7). NTIS, PC A02/MF A01. Order Number DE81025144.

From Conference on the application of microprocessors to high energy physics experiments; Geneva, Switzerland (4 May 1981).

The increasing size and complexity of high energy physics experiments is changing the way data are collected. To implement a trigger or event filter requires complex logic which may have to be modified as the experiment proceeds. Simply to monitor a detector, large amounts of data must be processed on line. The use of microprocessors or other programmable devices can help to achieve these ends flexibly and economically. At SLAC, a number of microprocessor-based systems have been built and are in use in experimental setups, and others are now being developed. This talk is a review of existing systems and their use in experiments, and of developments in progress and future plans.

44 INSTRUMENTATION

4401 Radiation Instrumentation

REFER ALSO TO CITATION(S) 27537, 27571, 27832, 27833, 27834, 27835, 27836, 27846, 27847, 27857, 27905, 27925, 28021

27577 (DOE/ER/10690—1) Electron-positron annihilation from 3 to 11 GeV. First progress report, 18 August 1980-15 Mar 1981. Darden, C.W. (South Carolina Univ., Columbia (USA). Dept. of Physics and Astronomy). 1981. Contract AS09-80ER10690. 15p. NTIS, PC A02/MF A01. Order Number DE81026010.

The ARGUS collaboration started forming in mid 1978. It was a natural outgrowth of the CASP II collaboration which had grown up to run the old DASP detector in late 1977. That was the year that the Upsilon meson was discovered at Fermilab. Both the PLUTO and DASP II collaborations were able to see the Upsilon in e^+e^- annihilations the following year and to confirm that it was indeed a narrow resonance. Late in 1978 the ARGUS collaboration submitted a proposal to the DESY Directorium to build a new universal magnetic solenoid detector that would allow the investigation of reactions of the type $e^+e^- >$ anything at energies that could be reached by the storage ring DORIS. This energy range included the Charm region and the first two Upsilon states, 1S and 2S. At the same time, the Directorium was urged to rebuild the storage ring DORIS to increase its luminosity and raise its maximum energy so that Upsilon spectroscopy could be done. Following the approval of the ARGUS detector, the finishing touches were put on its design and various parts either put out for bid or spoken for by different groups in the collaboration. Progress toward completion has been satisfactory and the status of each is discussed.

27578 (LA-UR—81-1945) Scintillators for fiber optics: system sensitivity and bandwidth as a function of fiber length. Lutz, S.S.; Franks, L.A.; Fluornoy, J.M.; Lyons, P.B. (Los Alamos National Lab., NM (USA); EG and G, Inc., Santa Barbara, CA (USA)). 1981. Contract W-7405-ENG-36. 9p. (CONF-810810—9). NTIS, PC A02/MF A01. Order Number DE81025354.

From SPIE international symposium; San Diego, CA, USA (24 Aug 1981).

Scintillators have been employed for several years as ionizing radiation-to-light converters in plasma diagnostic experiments that utilize fiber optics. Until recently, nanosecond and subnanosecond scintillators were available only in the near ultraviolet. However, the bandwidth and transmission properties of fiber optics both strongly favor operation at longer wavelengths. More recently, nanosecond and subnanosecond scintillators with emission peaks around 480 nm have been reported. A time-resolved plasma-imaging experiment using one of these scintillators and 100 channels of graded-index fiber, each 500 m long, has been successfully tested on a nuclear event at the Nevada Test Site. During the past year we have developed several new scintillator systems with emission wavelengths more compatible with fiber optics and with response times in the nanosecond and subnanosecond time region. One scintillator, based on Kodak dye 14567 (DCM), has an emission maximum at 650 nm and a response time (FWHM) of 1.2 ns. Experimental data on system sensitivity and bandwidth versus fiber length are presented for three fluor-fiber systems. Data on fluor formulation, response time, and linearity-of-response are given, and a model for scintillator nonlinearity, based on solvent, radiation-induced, transient absorption, is presented.

27579 (LA-UR—81-1946) Fiber optic neutron imaging system: calibration. Malone, R.M.; Gow, C.E.; Thayer, D.R. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 6p. (CONF-810810—8). NTIS, PC A02/MF A01. Order Number DE81025357.

From SPIE international symposium; San Diego, CA, USA (24 Aug 1981).

Two neutron imaging experiments using fiber optics have been performed at the Nevada Test Site. In each experiment, an array of scintillator fluor tubes is exposed to neutrons. Light is coupled out through radiation resistant PCS fibers (8-m long) into high-bandwidth, graded index fibers. For image reconstruction to be accurate, common timing differences and transmission variations between fiber optic channels are needed. The calibration system featured a scanning pulsed dye laser, a specially designed fiber optic star coupler, a Tektronix 7912AD transient digitizer, and a DEC PDP 11/34 computing system.

27580 (SLAC-PUB—2726) On-line experience with the 168/E. Carroll, J.T.; Brau, J.E.; Maruyama, T.; Parker, D.B.; Chima, J.S.; Price, D.R.; Rankin, P.; Hatley, R.W. (Stanford Linear Accelerator Center, CA (USA); Imperial Coll. of Science and Technology, London (UK); Science Research Council, Chilton (UK). Rutherford and Appleton Labs.). Apr 1981. Contract AC03-76SF00515. 14p. (CONF-810539—6). NTIS, PC A02/MF A01. Order Number DE81024356.

From Conference on the application of microprocessors to high energy physics experiments; Geneva, Switzerland (4 May 1981).

Current 20 GeV/c photoproduction experiments at the SLAC Hybrid Facility require a decision to take a picture within 150 to 300 μs after the beam pulse. A charged track trigger is provided by a 168/E processor which finds tracks in a downstream PWC system. To meet trigger time requirements the 168/E SNOOP module CAMAC interface is augmented by a CAMAD Auxiliary Controller and dedicated I/0 cards in the 168/E chassis. Between beam pulses a floating point Fortran program executing on a 168/E monitors data acquisition. Experiences with software development and application are reviewed.

27581 (UCRL—85608) Radiation-to-light converters for nuclear environments: deep red emitters. Rotter, M.D.; Roeske, F.; Calavan, P.M.; Lutz, S.S. (Lawrence Livermore National Lab., CA (USA); EG and G, Inc., Goleta, CA (USA)). 18 Jun 1981. Contract W-7405-ENG-48. 9p. (CONF-810810—5). NTIS, PC A02/MF A01. Order Number DE81023154.

From SPIE international symposium; San Diego, CA, USA (24 Aug 1981).

This report gives the preliminary results on work done to find a scintillator that is compatible with high-bandwidth, long-distance fiber-optic transmission. The requirements for such a scintillator are: (1) emission in the near-IR; (2) linear output over 2 to 3 decades of input excitation; (3) time response < 2 ns; and (4) immunity to radiation damage. The behavior of single crystal cadmium sulfide (CdS) and cadmium selenide (CdSe) was examined under electron and laser excitation. Both crystals emit in the deep red, however, time response was found to be slower than 2 ns. Neither crystal exhibited good linearity over the entire range of input excitation.

27582 DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981). 361p. (CONF-800775—(Vol.1)).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

The symposium included reports on the latest developments in detector array design and a survey of related experiments and accelerator developments. Volume one includes environmental studies, detector studies, array studies, and cosmic ray physics. Abstracts of individual items from the symposium were prepared separately for the data base. (GHT)

27583 Optical properties of the Keahole-DUMAND site. Zaneveld, J.R.V. (Oregon State Univ., Corvallis). pp 1-8 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

Spectral beam attenuation profiles measured down to 4567 m depth at the Keahole site give beam attenuation coefficients of 0.036 m^{-1} at 450 nm and 0.025 at 500 nm (attenuation lengths of 27 m and 40 m, respectively) 100 m above the bottom. Moored transmissometers (light source of 660 nm) showed a steady increase from a beam attenuation coefficient of 0.433^{-1} to 0.642 m^{-1} in 62 days, after which the recorder in the current meter failed. The increase is attributed to obscuration of the transmissometer windows by settling particles.

27584 Measurements of uncollimated light transmission distance. Bradner, H.; Blackinton, G. (Univ. of Hawaii, Honolulu). pp 9-22 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

Measurements have been made of the uncollimated (poor geometry) l/e transmission distance of light in seawater, at approximately 1 km and 1.5 km depths, 27 km east of the center of the proposed DUMAND site off Keahole Point, Hawaii. the measurements were made with 480 nm blue-green light, through path lengths of 84.0 and 7.86 meters.

27585 Detector module comparisons. Bowen, T. pp 23-39 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

This report lists some of the important questions which must be considered in the design and comparison of optical detector modules for DUMAND arrays. In most cases, answers require detailed analyses which need much more time than was available.

27586 Design of the Sea Urchin module. II. Spine design. McGibney, D.; Roberts, A. (Hawaii DUMAND Center, Honolulu). pp 40-58 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

This is a progress report on the design of spines for Sea Urchin.

27587 Design of the Sea Urchin module. III. Experimental measurement of spine efficiency, and redesign for improved sensitivity. Roberts, A.; McGibney, D. (Hawaii DUMAND Center, Honolulu). pp 59-64 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

With the measurement of the quantum efficiency of the fluor and the optical efficiency of single Sea Urchin spines, it is possible to calculate the sensitivity of the Sea Urchin module from observed quantities and compare it with predicted values. The sensitivity of the module is found to be about half the theoretical value. However, the theoretical prediction does not take into account absorption and re-emission of the fluorescent light in the spines. Reasons for attributing the discrepancy to this factor are given. The most readily improved parameter in the original Sea Urchin design is the opacity. This is significantly increased by a new design in which the original 8″ PMT in a 17″ sphere is replaced by a 13″ tube in a 26″ sphere. The design sensitivity of 6 stengers is readily reached with that design, and its other advantages are discussed.

27588 Fluorescent light detector in DUMAND. Kitamura, T.; Saito, T. (Univ. of Tokyo, Tanashi). pp 65-75 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

It is important to design the most efficient and cheapest Cerenkov light detector with a large area for DUMAND project. The light collector of long glass pipe with 2 cm diameter were tested using the various fluors and solvents suggested by Roberts and Learned. The attenuation length was observed to be shorter than 2 m, and the light collection efficiency was smaller than 10^{-2} at the distance of 1 m from the phototube. The observed values are shown to be consistent with the values evaluated under the simple model for light trapping and reflections.

27589 Case for very large photomultipliers: DUMAND, July-August 1980. Wright, A.G. (EMI Electron Tubes, Ruislip, England). pp 76-78 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

Alternative detector modules for DUMAND are considered. The sea-urchin concept, quite naturally, is based on existing tube technology but it is worth exploring other possibilities involving purpose-built tubes for DUMAND. The sea-urchin provides 4 to 5 photoelectrons from a flux of 50 photons m^{-2} (shifted to 550 nm). The calculation assumes using as S 20 cathode but this is not really necessary since the S 11 and bialkali cathodes have about the same quantum efficiency as the S 20 at 550 nm. Photomultipliers with the S 20 photocathode tend to be more expensive. An alternative detector consists of a bare photomultiplier with sufficient cathode area to provide 4 to 5 photoelectrons directly from the primary photon flux of 50 m^{-2}. An immediate advantage is gained from the fact that the primary flux is at $\sim$ 450 nm compared with the shifted light at 550 nm. Assuming eta(450) = 20%, then we need a photocathode of area 0.5 m^2 to provide 5 photoelectrons. It is useful to compare the photoelectron yields from hemispherical tubes of various diameters and also the background contribution from ^{40}K.

27590 Coincidence vs high-gain first dynodes - once more, with feeling. Roberts, A. (Univ. of Hawaii, Honolulu). pp 79-82 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

Manufacturers of photomultiplier tubes have rather strong biases, based on long experience, in favor of certain design features, and against others. In particular, they prefer relatively simple photocathodes to complex ones; thus S-11 and bialkali cathodes are preferred to S-20 (trialkali), which, though more sensitive in the red, are more difficult and expensive to prepare. In searching for fluors for wavelength-shifting sensors like Sea Urchin, the designers have accordingly been guided by this preference, and have selected Hostasol 8G, a fluor whose efficiency is as great when viewed by S-11 or bialkali photocathodes as by S-20. The other preference of the manufacturers is to avoid high-gain first dynodes - e.g., gallium phosphide - which, although they markedly improve pulse-height resolution, add to the difficulties of manufacture. The fact that such high-gain first dynodes allow one to distinguish pulses originating from one photoelectron from those starting with two, makes it feasible simply to use a threshold discriminator to get rid of a large fraction of the very high K40 background. This is not possible without such a high-gain dynode, and in that case other methods must be used. The most hallowed and obvious of these is the use of coincidences between two or more phototubes. The present remarks are prompted by the paper of Wright. In the case of large WLS detectors like Sea Urchin,there is no practical alternative to the high-gain first dynode. More reasonable is an alternative in which direct-view sensors of comparable sensitivity are placed in coincidence to decrease the background sufficiently.

27591 Estimation of 1st high gain dynode utility. Hayakawa, T.; Hayashi, T. (Hamamatsu TV Co., Ltd., Japan). pp 83-87 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

In DUMAND, it is important to distinguish the signal from the background noise particularly caused by the K^{40} radioactivity in the seawater. A. Roberts suggested the K^{40} light flux of 150 quanta/cm^2.sec using the value appropriate to 20-m water, and almost background will make single-photoelectron event noise. In order to reduce the background in a trigger selection, it might be able to apply the nature of difference between signal and background of temporal distribution. Emphasis of this different nature at an opto-electronic detector such as photomultiplier, for this meaning, it is essential technique, for example, enlarging detection area for one module, temporal coincidence and pulse height discrimination to signal processing. This paper proposes how to estimate the first high gain dynode utility to discriminate the signal pulse from background noise in DUMAND.

27592 Calculation of accidental coincidence rates in a DUMAND array. Bowen, T. (Univ. of Arizona, Tucson). pp 88-103 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

Different formulas have been used by Davisson and by Learned and Roberts in previous DUMAND proceedings to calculate the accidental coincidence rate in an optical DUMAND array. A derivation is given which agrees with Davisson. On the basis of a general scaling relation suggested by Cline, a figure of merit is derived for comparing modules of varying sensitive areas and spacing. It is shown how the accidental rates may be calculated if the PMT counting rate versus discriminator threshold is known for various ambient light levels (including complete darkness). As an example, these functions are estimated for an ideal PMT having a Poisson distribution of photoelectrons and of secondary electrons from each electron impacting the first dynode. For this idealized case, a module with Sea Urchin sensitivity containing a single PMT must be operated at a threshold of four photoelectrons, whereas a module with two PMT's in coincidence must give 5.5 photoelectrons for equivalent sensitivity and background counting rate.

27593 Detector for background light measurement in the deep ocean. Kawashima, Y.; Matsuno, S.; Ohashi, Y. (Univ. of Tokyo, Japan). pp 104-108 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

It is considered there are some kinds of light sources even in the deep ocean. An instrument was designed with a photomultiplier to measure background light in the deep ocean. The instrument was constructed under the condition of limited size and power consumption.

27594 Proposed modification to DUMAND G: DUMAND G2. Roberts, A. (Hawaii DUMAND Center, Honolulu); Wilkins, G.A. pp 116-125 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

A revised DUMAND G2 array is proposed. Its ground plan is a rhomboid of area 0.866 km^2, 1000m on a side, with 21 rows of 21 strings each, with 15 modules per string. With a spacing of 50m between elements, this yields a volume of 0.60 km^3. The total number of modules is now 6615, as compared with 22,698. Although area and volume are reduced by a factor of 2, the total cost is now estimated as under $20M, as compared with $89M for the 1978 standard array.

27595 Monte Carlo studies of DUMAND array performance. I. Symposium report. Stenger, V.J. (Univ. of Hawaii, Honolulu). pp 126-135 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

The performance of the DUMAND optical array, as measured in terms of the detection efficiency, angular and energy resolution of muons and hadronic cascades, is studied as a function of the parameters of the array: detector sensitivity and spacing.

27596 Monte Carlo studies of DUMAND array performance. II. Further work on detection of muon neutrinos via single recoil muons. Roberts, A.; Stenger, V.J. (Univ. of Hawaii, Honolulu). pp 136-160 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

Two arrays proposed at the 1980 DUMAND Summer Workshop/Symposium, namely a MINI array with 10m spacing, 100m overall dimension, and a MIDI array with 50m spacing, 500m overall dimension, have been evaluated by means of Monte Carlo studies, for their ability to detect and determine the direction of single muons. Other properties, such as cascade detection or multiple muon detection, have not been considered. The studies indicate that the 10m spacing is uneconomically small; the MINI array should have at least 15m, perhaps 20m spacing. The MIDI array, evaluated on the assumption of the availability of a Sea Urchin or other sensor with a sensitivity S = 6, can have a 50 to 55m spacing if the water transparency (attenuation length for Cerenkov light) is 25m, somewhat less if only 10m. The use of timing information materially improves angular resolution. The MINI array resolution should be 8 to 10mr, the MIDI 5mr. Higher sensitivity than S = 6 is not particularly useful, nor are very large array spacings. With larger arrays (more sensor planes), considerable higher angular accuracy is possible, up to 1.5mr.

27597 Generation and propagation of Cerenkov light in the DUMAND Monte Carlo program. Stenger, V.J.; Roberts, A. (Univ. of Hawaii, Honolulu). pp 161-168 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

The procedure used in the DUMAND Monte Carlo program (DUMC) for the generation of Cerenkov light by muons and hadronic cascades in the ocean, and its propagation thorough the ocean to a detector module position is described.

27598 Angles of lepton and hadron system in high energy νN interactions. Stenger, V.J. (Univ. of Hawaii, Honolulu). pp 169-171 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

A Monte Carlo has been used to predict the distribution of scattering angles for the lepton and hadron system in νN interactions at DUMAND energies, 0.1 to 100 TeV. The lowest energy is compared with bubble chamber data from Fermilab.

27599 Proposed 1980 DUMAND Master Buoy array. Talkington, H.R. (Naval Ocean Systems Center, San Diego, CA). pp 172-179 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

A small sized (micro-) array of optical sensors is proposed, as a low cost means of installing a minimal group of sensors at the DUMAND deep water site to prove that the DUMAND optical signal can be detected. The configuration of the array is characterized by a Central or Master Buoy that acts as a transportation and deployment pod, and contains central power and signal processing equipment for a group of automatically dispersed satellite sensor packages. Nineteen vertical strings of sensors would be deployed with 10 sensor modules per string, at a spacing of 50 m. There would be one string above the center, or master buoy, six strings evenly spaced about a 50 m radius and 12 strings along a 100 m radius providing an approximate spacing of 50 m between the sensors. This would provide an instrumented cylinder 200 m in diameter, 500 m high, containing a volume of 1.5 x 10^7 cubic meters. The key to this concept is a gravity drop of all of the parts assembled tightly to the master buoy, then deployed horizontally via glide body anchors to their final location, with all connecting cables prewired, with power and processing contained in the master buoy; and no undersea vehicle, drill ship, or cable ship required.

27600 Neutrino physics possibilities with a graded sensor array in DUMAND. Cline, D.B. (Fermilab, Batavia, IL). pp 180-186 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

The possibility of covering a small fraction of the 10^9 ton DUMAND array with a close packed sensor array (central detector with spacing of 10 to 15 m) and the remainder with a 100 m spacing array is discussed. The central detector can be used to observe the μ's produced by neutrino interactions in the outer detector and low energy (ν/sub μ//ν/sub e/) interactions. This detector has a very wide dynamic range and sufficient angular resolution to observe astrophysical point-like sources of neutrinos in the energy range of 10^{-4} GeV.

27601 Multiplication of effective detector volume for fast muons. Roberts, A. (Univ. of Hawaii, Honolulu). pp 187-189 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

The effective volume for the detection of neutrinos by means of the muons they produce is calculated for spherical detectors.

27602 Minimum detectable flux of extraterrestrial neutrinos: a criterion for array selection. Stenger, V.J. (Univ. of Hawaii, Honolulu). pp 190-202 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

It is proposed that the criterion for selecting the DUMAND array configuration be based on the minimum detectable flux (MDF) of extraterrestrial neutrinos. The procedure for calculating the MDF for a given array is described. It is shown that in searching for point sources the background of events from atmospheric muon and electron neutrinos is comparable, except for ν/sub μ/ in the largest detectors. Thus even though the atmospheric ν/sub e/ flux is much lower, there is no particular advantage for emphasizing ν/sub e/ over ν/sub μ/. Further, because of the ability to detect ν/sub μ/ events outside the array and the greater sensor spacings possible when one optimizes for muon detection, DUMAND is intrinsically more sensitive to a muon neutrino extraterrestrial flux and the best DUMAND array is still the one with the widest possible detector spacings. The quantitative estimates for the MDF in $cm^{-2}s^{-1}$ above 1 TeV are of the order of 10^{-10} to 10^{-9} for ν/sub μ/ point sources, 10^{-8} for ν/sub e/ point sources, 10^{-9} for ν/sub μ/ diffuse sources and 10^{-7} for ν/sub 3/ diffuse sources.

27603 Air shower detection systems for DUMAND: workshop section IIIc. Part 3. Discussion of the two possible systems. Elbert, J. (Univ. of Utah, Salt Lake City). pp 219-221 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

Some questions concerning the feasibility and capabilities of the two suggested systems are discussed. The systems are compared to each other and advantages of building both systems are mentioned.

27604 Possible studies with DUMAND and a surface air shower detector. Elbert, J.W. (Univ. of Utah, Salt Lake City); Gaisser, T.K.; Stanev, T. pp 222-228 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

The number of high energy muons in an air shower is sensitive to the mass of the primary nucleus, heavy primaries being much more likely to generate several muons than protons. Moreover, this sensitivity is enhanced if the energy of the shower can be determined on an event-by-event basis. In view of recent suggestions that it might be possible to combine a surface detector with a prototype DUMAND array, the calculations made for deep underground muons have been extended to the undersea case.

27605 Proposal for a ship deplyed >500 m^2 deep ocean muon detector. Learned, J.G. (Univ. of Hawaii, Honolulu). pp 242-257 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

It is proposed to construct a string of 5 photodetectors consisting of 13" EMI photomultipliers in 17" Benthos glass pressure housings plus ancillary electronics, spaced 2 to 5 m apart vertically and operated at depths >1 km from a ship. Such detectors should be able to detect minimum ionizing muons passing at typical distances of $\sim$ 15 m. Thus this detector would have an effective muon area $\sim$ 700 m^2, larger than any existing underground detector and far larger than any used in the deep ocean to date. A relatively short, 10-day exposure with real time data monitoring could produce useful depth-intensity data. Timing would further provide modest angular resolution. Observation of 4 expected upcoming muons in this period would signal the first underwater neutrino detection. Other experiments and background studies are also suggested.

27606 Study of ultrahigh energy hadronic interactions using deep ocean and air shower arrays. Cline, D.B. (Fermilab., Batavia, IL). pp 258-261 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

The DUMAND array might be used to study hadronic interactions above 10^{17} eV as well as the study of extremely high energy heavy ion collisions with atmospheric nuclei. Such collisions might produce new states of quark matter. In order to identify such processes it would be necessary to tag the incident particle (proton or nuclei) using an extensive air shower detector (Flys Eye of equivalent) and to observe the details of the interaction through the energetic muons that were produced.

27607 Experiments for DUMAND-M. Shapiro, M.M.; Silberberg, R. (Naval Research Lab., Washington, DC). pp 262-266 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

A small-sized DUMAND array of 3 x 10^7 tons could serve as a versatile detector for experiments in muon physics, extensive air showers, atmospheric neutrinos and neutrino oscillations. In particular, the first two of these investigations are suitable for exploring the composition of the very high-energy cosmic-ray primaries. Measurements of the rate of prompt neutrino production (derived via massive quark states) could also be carried out.

27608 Interactions of high energy muons in DUMAND-M. Dau, W.D. (Kiel-Univ., Germany). pp 276-280 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

A Monte Carlo study of DUMAND-M muons has been performed to calculate energy loss and its fluctuations, the number of interactions per muon passage, and rates for interactions of 1 year running time.

27609 DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981). 302p. (CONF-800775—(Vol.2)).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

Volume two of the conference covers anticipated uses of the DUMAND array. Areas covered include underground experiments, neutrino mass and oscillations, neutrino astrophysics and stellar collapse, and high energy physics and astrophysics. (GHT)

27610 Future large European underground experiments. Conversi, M. (Univ. of Rome, Italy). pp 10-20 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

The prospects of the experimental program in possible future European underground laboratories include the development of a modular multikiloton visual detector suitable to see and identify most of the expected final states resulting from the nucleon decay. The detector is essentially a fine grain calorimeter, with 3 mm sampling iron plates alternated with flash chambers triggered by limited streamer counters. Its mass could reach the 10 Kt region (about 10^7 flash cells) at a cost still accessible to the European Physics Community.

27611 **Neutrino oscillations in DUMAND.** Stenger, V.J. (Univ. of Hawaii, Honolulu). pp 37-44 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

A Monte Carlo simulation of a one-year experiment with a 0.9 km^3 DUMAND array yields 18,656 expected events with one muon from ν/sub μ/ charged-current interactions. It is shown that neutrino oscillations resulting from eigenmass-squared differences in the range 0.1 to 1000 eV^2 would be detectable as a modulation of the one-muon event rate with zenith angle. Using several proposed models, it is shown that the statistics and measurement precision are adequate to aid in the determination of mass differences and mixing angles and perhaps provide unique information on matter oscillations.

27612 **DUMAND as a tau detector.** Learned, J.G. (Univ. of Hawaii, Honolulu). pp 272-277 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

It is pointed out that tau leptons produced with enough energy (>300 TeV) to travel significant distances before decaying would be uniquely identifiable in a DUMAND array because of their relatively light ionization followed by spectacular decay, usually without emerging muon. Also because tau's never range out, DUMAND will have an effective volume for ν/sub tau/ detection that grows with energy making DUMAND a more effective ν/sub tau/ than ν/sub μ/ detector above $\sim 3 \times 10^{17}$ eV. At $>10^{20}$ eV tau's may traverse the whole earth.

27613 **Local energy transfer to TLDs by neutrons and photons.** Singh, M.S.; Gaines, J.L.; Parlagreco, J.R. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). *Nuclear Instruments and Methods ;* **175**: No. 1, 31-33(Sep 1980).

From 6. international conference on solid state dosimetry; Toulouse, France (1 - 4 Apr 1980).

The local energy transferred from neutrons and photons to TLD materials with respect to energy transferred to biological tissues or air has been calculated. Experimental response of TLDs was measured for photons with energies above 1.5 keV.

4402 Radiation Effects On Instrument Components, Instruments, Or Electronic Systems

REFER ALSO TO CITATION(S) 27552

27614 **(SAND—81-0126) Radiation-induced conductivity and high temperature Q changes in quartz resonators.** Koehler, D.R. (Sandia National Labs., Albuquerque, NM (USA)). Jun 1981. Contract AC04-76DP00789. 25p. NTIS, PC A02/MF A01. Order Number DE81025892.

While high temperature electrolysis has proven beneficial as a technique to remove interstitial impurities from quartz, reliable indices to measure the efficacy of such a processing step are still under development. The present work is directed toward providing such an index. Two techniques were investigated - one involves measurement of the radiation-induced conductivity in quartz along the optic axis, and the second involves measurement of high temperature Q changes. Both effects originate when impurity charge compensators are released from their traps, in the first case resulting in an associated increase in ionic conduction and in the second case resulting in increased acoustic losses. Radiation-induced conductivity measurements were carried out with a 200 kV, 14 mA X-ray machine producing approximately 5 rads/sec at the sample. With electric fields of the order of 10^4 V/cm, the noise level in the current measuring system is equivalent to an ionic current generated by quartz impurities in the 1 ppB range. The accuracy of the high temperature (300 to 800 K) Q^{-1} measurement technique is limited by the uncertainties associated with quantitative correlation of the high temperature acoustic losses with the concentration of impurity centers. A number of resonators constructed of quartz material of different impurity contents have been tested, and both the radiation-induced conductivity and the high temperature Q^{-1} results compared with earlier radiation-induced frequency and resonator resistance changes. A postirradiation-induced conductivity index and a high temperature Q index show excellent correlation with the earlier pulsed irradiation-induced dynamic resonator motional resistance changes, and it is therefore concluded that either measurement can be employed to serve as an acceptance criterion for radiation hardness.

27615 **(SAND—81-1278C) Advanced composite aircraft electromagnetic design and synthesis.** Wallenberg, R.F.; Birken, J.A.; Milton, O. (Sandia National Labs., Albuquerque, NM (USA); Naval Air Systems Command, Washington, DC (USA); Syracuse Univ. Research Corp., NY (USA)). Apr 1981. Contract AC04-76DP00789. 9p. (CONF-810816—1). NTIS, PC A02/MF A01.

From IEEE international symposium on electromagnetic compatability record; Boulder, CO, USA (18 Aug 1981).

The US Navy has been investigating the ramifications of using advanced composite materials in its upcoming aircraft. Mission requirements now include fly-by-wire systems surviving increased threats when contained in a composite material fuselage which generally provides poor electromagnetic shielding. This paper addresses the coupling of lightning and a nuclear electromagnetic pulse to aircraft comprised of composite materials.

4403 Miscellaneous Instruments

REFER ALSO TO CITATION(S) 26748, 27661, 27701, 27713, 27714, 28024

27616 **(LA-UR—81-1665) Direct subnanosecond voltage monitors.** Barth, J.E.; Sajeant, W.J. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 5p. (CONF-810659—19). NTIS, PC A02/MF A01. Order Number DE81025293.

From 3. IEEE international pulsed power conference; Albuquerque, NM, USA (1 Jun 1981).

Advanced system development in the subnanosecond time frame increasingly demands high-resolution voltage measurements for both single-shot and repetitive operation. Voltage monitors having capabilities up to the hundred kilovolt level have been developed for direct measurements in discrete and transmission line geometries. Resolutions of 100 ps at 100 kV to 30 ps at 20 kV have been achieved. Detailed test data is presented and ultimate voltage scaling limits are discussed.

27617 **(LA-UR—81-1808) Scanning microellipsometer for the spatial characterization of thin films.** Dunlavy, D.J.; Hammond, R.B.; Ahrenkiel, R.K. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 6p. (CONF-810429—35). NTIS, PC A02/MF A01. Order Number DE81025306.

From Conference on optics; Santa Fe, NM, USA (6 Apr 1981).

A polarization-modulated ellipsometer was constructed to investigate the optical properties of surfaces and transparent thin films. In the latter case, the measurement gives a unique determination of the index of refraction n and film thickness t. Using a HeNe laser light source, the beam was focused to a spot size of 50 μm. By stepping the sample across the focal point of the laser beam in both x and y directions, the spatial uniformity could be measured. This apparatus was particularly useful for optical profiling laser-annealed oxide films grown on GaAs. A new technique for laser annealing native oxides on GaAs produced the need for observing spatial structure with spatial resolution of less than 100 μm. Here the laser

pulse produced a crater in the oxide due to localized healing and subsequent densification of the film. This technique allows profiling of film index of refraction and thickness across the laser irradiated area - about 2 to 3 mm in our case. A number of applications in microelectronics are suggested. 6 figures.

27618 **(MLM—2839) Test and evaluation of an Argonne National Laboratory bulk assay calorimeter.** Rodenburg, W.W.; Fellers, C.L.; Lemming, J.F. (Mound Facility, Miamisburg, OH (USA)). 30 Jun 1981. Contract AC04-76DP00053. 21p. (ISPO—137). NTIS, PC A02/MF A01. Order Number DE81025692.

The Argonne National Laboratory bulk assay calorimeter (BAC) was subjected to a series of tests, using plutonium-238 heat standards, to evaluate the performance of the calorimeter over its operating range. The results of these tests provide baseline information of the instrument performance under laboratory conditions.

27619 **(UCRL—86288) Linear array synthesis via a constrained version of Prony's method.** Goodman, D.M.; Miller, E.K. (Lawrence Livermore National Lab., CA (USA)). 22 Jun 1981. Contract W-7405-ENG-26. 14p. (CONF-810810—3). NTIS, PC A02/MF A01. Order Number DE81023948.

From SPIE international symposium; San Diego, CA, USA (24 Aug 1981).

A technique for designing antenna arrays whose sources are located along a line is presented. Unlike most approaches to linear array synthesis, this technique optimizes source locations as well as source strengths. The technique is based on a modification of Prony's method.

27620 **Double-reflection x-ray spectrometer for pulsed-source diagnostics.** Stoering, J.P.; Crabb, R.; McGee, M.E.; Burginyon, G.A. (Lawrence Livermore National Laboratory, University of California, Livermore, California 94550). Contract W-7405-ENG-48. *Review of Scientific Instruments ;* **52**: No. 6, 825-830(Jun 1981).

The mirror technique provides a promising new soft x-ray, energy-resolving capability. Mirrors have the uncommon but very useful characteristic of behaving as low-pass filters. If x-ray absorption is low, then the change in reflection across the critical cutoff energy at a particular mirror angle is quite sharp and can be used to resolve x-ray spectra with energy resolution comparable to solid-state detectors. The properties of mirrors that enable them to resolve x-ray spectra have been incorporated into a two-mirror intermediate-resolution x-ray spectrometer, which is described here. The instrument is capable of measuring pulsed-source x-ray spectra between a few tenths and about 8 keV.

27621 **Moessbauer spectroscopy cell for in situ catalyst characterization and reaction kinetics studies at high pressures.** Shen, W.M.; Dumesic, J.A.; Hill, C.G. Jr. (Department of Chemical Engineering, University of Wisconsin, Madison, Wisconsin 53706). *Review of Scientific Instruments ;* **52**: No. 6, 858-862(Jun 1981).

A stainless steel cell with beryllium windows has been used for carrying out in situ Moessbauer spectroscopy studies (with a vertical γ-ray beam) at pressures up to 6.8 MPa and temperatures up to 773 K. The downflow of gas through the powdered catalyst sample minimizes bulk gas phase concentration gradients in the cell above the catalyst layer, and this allows reaction kinetics measurements to be routinely analyzed. Incorporation of a prereactor and/or postreactor makes it possible to model longitudinal variations of catalyst states in a packed catalyst bed.

27622 **Semileaky thin-film optical isolator.** Kirsch, S.T.; Biolsi, W.A.; Blank, S.L.; Tien, P.K.; Martin, R.J.; Bridenbaugh, P.M.; Grabbe, P. (ROLM Corporation, 4900 Old Ironsides Drive, Santa Clara, California 95050). Contract E(11-1)-3070. *Journal of Applied Physics ;* **52**: No. 5, 3190-3199(May 1981).

Two interesting effects have been experimentally demonstrated for the first time: (1) simultaneous reciprocal and nonreciprocal mode conversion to achieve an isolation effect and (2) magneto-optic switching between guided and radiation modes. These effects were observed in connection with the construction of a previously proposed thin-film optical isolator. The isolator consists of a piece of $LiNbO_3$ placed on top of a thin film of yttrium ion garnet (YIG) with a selenium layer to avoid optical contact problems. The isolator, which is 1 cm long, exhibited 10 dB of isolation at $\lambda = 1.15$ μm. The observed isolation was better than theoretical predictions and a mysterious isolation direction dependence on mode order was observed. Although the device had 10 dB of insertion loss and required a magnetic field of 40 Oe, with a slight change in wavelength and film composition, it should be possible to reduce the insertion loss and field required to under 1 dB and 0.1 Oe, respectively. These characteristics combined with broad tolerances on film thickness and the length of the isolation region, broadband operation (from $\lambda = 1.1$ to 4.5 μm), and easy construction and adjustment make the isolator very attractive for use in integrated optics.

27623 **Automated enzyme assays by use of a centrifugal analyzer with fluorescence detection.** Pearson, K.W.; Smith, R.E.; Mitchell, A.R.; Bissel, E.R. (Lawrence Livermore National Lab., CA). Contract W-7405-ENG-48. *Clinical Chemistry (Winston-Salem, North Carolina) ;* **27**: No. 2, 256-262(Feb 1981).

The first commercially available centrifugal analyzer having fluorescence detection capability was used to develop kinetic fluorometric assays for several proteinases. The substrates were all synthetic oligopeptides incorporating 7-amino-4-trifluoromethylcoumarin, a molecule that can be detected either spectrophotometrically or fluorometrically. We thus compared the centrifugal analyzer spectrophotometric and fluorometric detection systems, finding fluorescence detection to be 50-fold more sensitive. We also compared the sensitivity of the fluorescence detector to that of a conventional spectrofluorometer by determining the minimum detection limit for each enzyme on both instruments; we found them to be similar in sensitivity.

27624 **(RFP-Trans—291) Applications of color micrography by formation of epitaxial thin films with interference colors in the study of aluminum, iron and copper.** Lacombe, P.; Mouflard, M. Translated from *Metaux: Corrosion-Industrie ;* No. 340, 471-488(1953). 32p. NTIS, PC A03/MF A01.

Color microscopy consists in developing colors due to the optical phenomena of interference or polarization at the surface of metal crystals. In contrast to the method of corrosion figures, which indicate the individual orientation of crystals, color microscopy is generally capable above all of defining the relative orientation of adjacent crystals, except in special cases in which color scales can be defined. The general methods are reviewed which can be used to develop colors, whether the metal is anisotropic or isotropic. The method of thin films with interference colors is also discussed. This method is applicable to isotropic metals of cubic symmetry. Applications to aluminum and its alloys and iron and copper are described.

45 EXPLOSIONS AND EXPLOSIVES

4501 Chemical

REFER ALSO TO CITATION(S) 27541

27625 **(LA-UR—81-1725) Calculated shock pressures in the aquarium test.** Johnson, J.N. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 6p. (CONF-810684—23). NTIS, PC A02/MF A01. Order Number DE81024389.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

A new method of analysis has been developed for determination of shock pressures in aquarium tests on commercial explosives. This test consists of photographing the expanding cylindrical tube wall (which contains the detonation products) and the shock wave in water surrounding the explosive charge. By making a least-squares fit to the shock-front data, it is possible to determine the peak shock-front pressure as a function of distance from the cylinder wall. This has been done for 10-cm and 20-cm-diam ANFO (ammonium nitrate/fuel oil) and aluminized ANFO (7.5 wt% Al) aquarium test data.

27626 (LA-UR—81-1870) Facilities for the study of shock-induced decomposition of high explosives. Vorthman, J.E. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 6p. (CONF-810684—22). NTIS, PC A02/MF A01. Order Number DE81025353.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

The facilities used by the Los Alamos Explosives Technology group to study the shock-induced decomposition of high explosives are described.

27627 (MHSMP—81-31) Evaluation of machining safety: PBX 9404 and LX-10. Process development: Endeavor No. 301. Rhoton, N.O. (Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)). Jul 1981. Contract AC04-76DP00487. 18p. NTIS, PC A02/MF A01. Order Number DE81026680.

Preliminary machining safety tests for PBX 9404 and LX-10 are reported. Both normal and runaway machining conditions were investigated in an attempt to determine threshold reaction levels for the two explosives on a lathe, band saw and drill press. Five type cutting operations and slippage of the explosive on a vacuum fixture were evaluated. The presence or absence of reaction was determined via a TV monitor and NO/sub x/ detection using a chemiluminescence monitor. The evolution of NO/sub x/ was detected in a large number of the tests. NO/sub x/ evolution from PBX 9404 was detected in most cases at milder machining conditions than from LX-10. Only during drilling tests with PBX 9404 was there evidence of reactions more severe than NO/sub x/ evolution. Burning and/or higher order reactions were not observed for any test.

27628 (SAND—81-0775/1) Deflagration-to-detonation transition project. Quarterly report, March-May 1980. Lieberman, M.L. (ed.). (Sandia National Labs., Albuquerque, NM (USA)). Apr 1981. Contract AC04-76DP00789. 119p. NTIS, PC A06/MF A01. Order Number DE81026945.

The activities of this project pertain primarily to the development of small, safe, low-voltage, hot-wire detonators. Its major goals are (a) the formulation of a modeling capability for DDT of the explosive 2-(5-cyanotetrazolato)pentaamminecobalt(III) perchlorate (CP); (b) the development of improved DDT materials; (c) the establishment of a data base for corrosion, compatibility, and reliability of CP-loaded detonators; and (d) the design and development of advanced DDT components. Progress is reported in detail. (WHK)

27629 (UCRL—52947) Detonation properties of TATB (an insensitive high explosive) when impacted by hypervelocity projectiles. Delistraty, J. (Lawrence Livermore National Lab., CA (USA)). Oct 1980. Contract W-7405-ENG-48. 46p. NTIS, PC A03/MF A01. Order Number DE81026060.

This investigation analyzes the reaction of TATB (1,3,5-triamino-2,4,6-trinitrobenzene), an insensitive high explosive, to hypervelocity impact by four projectiles of two types: rod and plate. Although referred to as TATB in this report, the explosive actually used is 92.5% TATB and 7.5% Kel-F 800 binder, a vinylidene fluoride-chlorotrifluoroethylene copolymer. Of the impacting projectiles, three are steel-rod assemblies ranging in weight from 32.6 to 34.6 g and composed of a rod 8 mm in diameter and 19 mm in length of which 9 mm protrudes from a Polyzelux holder. The fourth projectile is a tantalum-plate assembly which weighs 23.9 g and is composed of a Ta plate 24.2 mm in diameter and 1.5 mm in thickness mounted on a Polyzelux holder. The Ta-plate event provides a highly efficient diverging detonation profile as predicted by similar previous investigations with flyer plates and TATB. Thus, the steel-rod events are compared to the Ta-plate event to determine if detonation has occurred. The projectiles are accelerated by a two-stage, light-gas gun to velocities in the range of 3.1 to 6.5 km/s (10,171 to 21,325 ft/s) and have bracketed the detonation threshold of the impacted TATB target. Comparisons of the TATB reaction data to a computer modeling of the experiment show that at 3.06 km/s, the computer model correctly predicts no initiation of detonation; at 4.75 km/s, the computer model correctly predicts a partial detonation; and at both 5.67 and 6.53 km/s, both the computer analyses and the experiments give divergent detonations.

4502 Nuclear

REFER ALSO TO CITATION(S) 26855, 27359, 27360, 27578, 28027

27630 (LA-UR—81-1944) Preparation, installation, and calibration of a 152-fiber imaging experiment at the Nevada Test Site. Thayer, D.R.; Lyons, P.B.; Looney, L.D.; Manning, J.P.; Malone, R.M. (Los Alamos National Lab., NM (USA); EG and G, Inc., Los Alamos, NM (USA)). 1981. Contract W-7405-ENG-36. 5p. (CONF-810810—10). NTIS, PC A02/MF A01. Order Number DE81025355.

From SPIE international symposium; San Diego, CA, USA (24 Aug 1981).

Fiber-optic transmission lines are being used with increasing frequency in the demanding environment of nuclear device diagnostic tests at the Nevada Test Site. Previous reports have described diagnostic experiments that utilize properties of fiber-optic cables to provide capabilities that are extremely difficult to obtain with coaxial cable systems. This paper describes an imaging experiment conducted during the last quarter of 1980 at the Nevada Test Site involving 152 ~ 0.6-km long GI fibers in 18 cables. An imager cell sensitive to neutron and gamma radiation was located at ~ 8 m from the source. Individual elements of the fluor were coupled by ~ 10 m PCS fibers (for radiation damage resistance) to the GI fibers used for the uphole and surface lines to the detector station. Light from the imager cell in a 9-nm band, centered at 540 nm, was detected by photomultipliers and the electrical signals then recorded on oscilloscopes. Overall system bandwidth, including the fluor, was ~ 80 MHz. Due to the complexity of the experiment and the conditions associated with field testing, the PCS and GI fibers were cut and terminated under laboratory shop conditions prior to installation at the field site. Procedures used for quality assurance of the fiber assemblies as well as procedures used in checking fiber throughput during installation are described. The application of a large star coupler (5 input x 200 output fibers) used for system time and amplitude calibration and an attempt to shutter fibers with neutrons for a multiplexing application are also discussed.

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC

5001 Basic Studies

REFER ALSO TO CITATION(S) 26986, 27319, 27652, 27664

27631 (UCRL—85753) Climate research priorities in the DOE CO_2 program. MacCracken, M.C. (Lawrence Livermore National Lab., CA (USA)). May 1981. Contract W-7405-ENG-48. 14p. (CONF-810687—2). NTIS, PC A02/MF A01. Order Number DE81024212.

From US/USSR workshop on carbon dioxide and climate; Leningrad, USSR (15 Jun 1981).

A four-pronged approach to considering the climate aspects of the CO_2 issue has been developed. First, a variety of climate models are being improved, particularly in terms of their representation of the oceans, so that their simulation of the regional and temporal response to increasing CO_2 can be made more realistic. Second, past climatic situations, particularly warm periods, are being studied as possible analogs for the warmer conditions that increased CO_2 concentrations are expected to induce. Third, the results of model and past climate studies will be combined so that comprehensive scenarios can be assembled for use in assessment studies. Finally, a research program is being developed that will seek early evidence to determine whether the climate is responding to increasing CO_2. Present results indicate that the climatic change from doubled CO_2 will be greater than 1.5°K, but that identifying evidence of such changes in the next twenty years will be difficult unless past climate variations and their causes are better understood.

27632 Land use and carbon storage in Georgia forests. Sharpe, D.M. (Southern Illinois Univ., Carbondale); Johnson, W.C. W-7405-ENG-26. *Journal of Environmental Management ;* **12**: No. 3, 221-233(May 1981).

Disparate estimates of trends in carbon storage in the major forest regions of the earth have focused attention on: (1) possible roles of forests in the global carbon budget, and in potential climatic change, and (2) the need for detailed regional studies of the impact of forest growth, exploitation, land use change, reforestation and storage of forest products on their carbon budgets as a preliminary for determining their aggregate impact on the global budgets as a preliminary for determining their aggregate impact on the global carbon budget. The carbon budget of the forests of the Upper Piedmont of Georgia is reconstructed from presettlement to the present, and the impact of alternative futures on the region's carbon budget modeled for the next three decades and for the next century. Historic trends are based on US Bureau of the Census and USDA Forest Service records. Alternative futures are assessed using a compartment model (each compartment is a forest type-biomass class) whose transfer coefficients were systematically altered to account for plausible changes in forest exploitation, management and area. Carbon storage declined from a presettlement value of 386 x 10^6 tonnes to about 40 x 10^6 tonnes during the height of agriculture. Post World War II reforestation increased it to 112 x 10^6 tonnes by 1972. Further increases are expected in the next several decades in spite of reductions in the forest land base. However, the impact on the global carbon cycle of a region undergoing agricultural development is five times that of a region in agricultural decline. Long-term projections suggest that the managed forests of a region may continue to be modest carbon sinks (increased carbon storage) largely through the storage of forest biomass and carbon in forest products.

5002 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 26790, 26791, 26792, 26793, 26794, 26795, 27113, 27115, 27116, 27129, 27454, 27563, 27646, 27648, 27649, 27760

27633 (CONF-810674—1) Contribution of residential wood combustion to local airshed pollutant concentrations. Meyer, H.R. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 12p. NTIS, PC A02/MF A01. Order Number DE81023222.

From 1981 international conference on residential solid fuels; Portland, OR, USA (1 Jun 1981).

For a variety of economic, political, and supply-related reasons, a resurgence in the use of residential wood combustion (RWC) for primary and secondary heating is currently occurring in the United States. While there are a number of positive aspects to this trend, the displacement of oil, gas, and electricity as residential heat sources will result in locally increased peak and annual-average air concentrations of certain pollutants. Carbon monoxide (CO), polycyclic organic materials, (POM), respirable particulates, and other hazardous materials are emitted via RWC directly into the local environment at rates greatly exceeding those associated with residential use of oil or gas. Models were developed to estimate both worst-case and seasonal-average air concentrations of key RWC emissions for representative US locations. Model results are compared to available measurements of ambient and RWC-specific concentrations. Acute episodal predictions are found to exceed US Environmental Protection Agency 24-h standards for particulates, and to approach the eight-hour CO standards. By indexing to benzo(a)pyrene, POM concentration estimates are cautiously related to potentially increased population health effects, specifically pulmonary carcinomas. The need for additional data collection and assessment work is emphasized.

27634 (DOE/CS/51180—T4) Technical operating documentation: Regional Emissions Projection System (REPS). Collins, M.M. (General Research Corp., Santa Barbara, CA (USA)). Nov 1979. Contract AC03-76CS51180. 238p. NTIS, PC A11/MF A01. Order Number DE81025814.

This document contains technical information useful in preparing and submitting computer runs of the Regional Emission Projection System (REPS) model. REPS consists of Fortran programs and data files that together can be used to produce forecasts of regional and national air pollution emissions. This document is designed to assist the person actually setting up the job control language to make REPS computer runs. It is not intended as a training manual. The REPS computer programs are internally documented in detail. This report is primarily a compilation of that documentation, along with a system flow chart and a listing of the REPS data set names and their location on the DOE system.

27635 (DOE/CS/51180—T5) Users guide: Regional Emissions Projection System (REPS). Collins, M.M. (General Research Corp., Santa Barbara, CA (USA)). Dec 1979. Contract AC03-76CS51180. 51p. NTIS, PC A04/MF A01. Order Number DE81025806.

The Regional Emissions Projection System (REPS) is a computerized model for forecasting regional air pollution to the year 2000. This report is a general description of REPS, designed for those who plan to use REPS as an emissions forecasting tool, but who do not necessarily plan to actually operate the model on the DOE computer. Examples of actual and potential applications for REPS are given, as well as a general description of the system logic, the types of output available, and the procedure for requesting a system run.

27636 (DOE/CS/51180—T6) Model description: Regional Emissions Projection System (REPS). Collins, M.M. (General Research Corp., Santa Barbara, CA (USA)). Dec 1979. Contract AC03-76CS51180. 73p. NTIS, PC A04/MF A01. Order Number DE81025807.

The Regional Emissions Projection System (REPS) is a computerized model for forecasting regional air pollution to the year 2000. This report describes the major variables, equations, and relationships assumed in the model, and discusses what the model is and how forecasts are obtained. A section of this report also describes the model's structure in terms of its computer programs, subroutines, and input and output files. There is also a short discussion of the evolution of the model and its major strengths and weaknesses. This document is designed for those who need to understand the detailed logic of REPS.

27637 (EPRI-WS—79-220(Vol.2), pp 644-666) **Assessment of NO/sub x/ flue gas treatment technology.** Mobley, J.D. (Environmental Protection Agency, Research Triangle Park, NC). May 1981. NTIS, PC A17/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

The Environmental Protection Agency has maintained a program to further the advancement of NO/sub x/ control by flue gas treatment technology since the early 1970's. The program consists of technology assessment studies in conjunction with small scale experimental projects. These activities have shown that 80 to 90% reduction of NO/sub x/ emissions by selective catalytic reduction with ammonia has been commercially demonstrated on gas- and oil-fired sources in Japan, and that such processes are ready for test application on coal-fired sources. The Japanese experience, combined with experimental projects in the US, should establish the technology as a viable control technique for use in tackling NO/sub x/ environmental problems in the US. However, some significant technical concerns need to be addressed in demonstration projects before widespread application of the technology can be recommended.

27638 (EPRI-WS—79-220(Vol.2), pp 668-717) **Development of flue gas treatment in Japan.** Nakabayashi, Y.; Yugami, H.; Mouri, K. (Electric Power Development Co., Ltd., Tokyo, Japan). May 1981. NTIS, PC A17/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

The Electric Power Development Co., Ltd. (EPDC) has been executing a research and development program on selective catalytic reduction (SCR) systems through joint research with the equipment manufacturers since 1975. As a result of this R & D program, EPDC believes there is a strong prospect for commercialization of the Low Dust SCR System (LDSS) for coal-fired power plants. At present, EPDC is constructing demonstration test equipment for such a system at the Takehara Thermal Power Station No. 1 Unit (250 MW coal-fired) and plans to construct full scale commercial SCR equipment at the Takehara Thermal Station No. 3 Unit (700 MW coal-fired). Alternatively, the High Dust SCR System (HDSS) is also a candidate for commercialization, requiring only the establishment of NH_3 removal technology for ash collect-

ed by a cold-side electrostatic precipitator. This report describes the results of the R & D program executed by EPDC concerning the SCR and air preheater problems, overall flue gas treatment technology for coal-fired boilers, and the outline of Takehara's SCR Systems.

27639 (EPRI-WS—79-220(Vol.2), pp 720-741) **Status of SCR retrofit at Southern California Edison Huntington Beach Generating Station Unit 2.** Johnson, L.W.; Overduin, C.L.W.; Fellows, D.A. (Southern California Edison Co., Rosemead). May 1981. NTIS, PC A17/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

Utilities in the Southern California South Coast Air Basin are subject to a regulation (Rule 1135.1) requiring 90 percent NO/sub x/ reduction. Rule 1135.1 is comprised of four basic compliance options of which the first two options require two stages with an intermediate milestone reduction and a demonstration unit of a 90 percent NO/sub x/ reduction system. This paper describes the Selective Catalytic Reduction (SCR) 107.5 MW Demonstration Facility SCE plans to install on one-half of Southern California Edison's Huntington Beach Unit 2, 215 MW boiler. The physical size, operation and maintenance, and controls for achieving 90 percent NO/sub x/ reduction through normal load variations as well as the status of the project are discussed. The system retrofit requirements are discussed with specific reference to the differences between the demonstration unit and other larger units and the site constraints for retrofit on the larger units. The operational and maintenance requirements for a systemwide retrofit and potential problem areas will also be reviewed. The paper will present cost estimates for the Huntington Beach demonstration facility as well as SCE's projection of cost for adding SCR on the majority of its oil-fired units in the South Coast Air Basin. These costs will include capital as well as operating and maintenance. All costs will be presented in 1981 dollars.

27640 (EPRI-WS—79-220(Vol.2), pp 900-928) **Conventional combustion environmental assessment program.** Ponder, W.H. (Environmental Protection Agency, Research Triangle Park, NC). May 1981. NTIS, PC A17/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

The Environmental Protection Agency's Industrial Environmental Research Laboratory at Research Triangle Park, North Carolina, has developed and implemented a major program for the assessment of the environmental, economic, and energy impacts of multimedia pollutant emissions from stationary residential, commercial, institutional, industrial, and utility combustion processes. The Conventional Combustion Environmental Assessment (CCEA) Program has become a major source of data and information for Agency use in developing and modifying standards and control technologies. This paper presents the theme, objectives, pollutants of concern, current activities, and some representative data from CCEA Program projects. Included are data from: (1) a comparative assessment of coal and oil firing in an industrial boiler, (2) environmental assessments of an 820 MW, FGD-controlled, coal-fired utility boiler and a 342 MW oil-fired utility boiler, (3) a 170-site field study of combustion sources, (4) dry bottom industrial boilers firing pulverized coal, (5) residential coal combustion, and (6) wood combustion studies.

27641 (MTR—81W77, pp 433-604) **End use.** Jul 1981. NTIS, PC A99/MF A01.

In Health and environmental effects of oil and gas technologies: research needs.

This section lists numerous research needs related to human health. Of particular importance is the newly recognized problem of indoor air pollution. Recent research has found that combustion of oil and gas products in the home has led to potentially harmful indoor levels of nitrogen dioxide, carbon monoxide, and radon. Nitrogen dioxide levels have been found to be significantly higher (in some cases seven times higher) in homes with gas stoves than in homes with electric stoves. Gas appliances have been cited as significant sources of carbon monoxide. However, air emission research has focused largely on air pollutants associated with the infiltration of automotive exhausts and on volatile solvents. Research on indoor radioactive emissions has focused on radon emanating from construction materials and on water supplies derived from aquifers located in sedimentary deposits rich in radioactive nuclides. Evidence suggests the possibility of an equal amount of radon released from the combustion of natural gas in gas ranges and space heaters. A large number of research needs involved dermal and inhalation effects associated with human exposure to petroleum products and combustion gases. These highlight an overall need for an expanded research effort dealing with exposures from oil and gas retailing. The nature and magnitude of acid and alkaline metal emissions from catalytic converters needs to be fully explored with respect to both health and environmental impacts. With respect to environmental effects research, additional research is seen as needed in the following areas: the biological transport of lead, cadmium, and nickel in soil and food chain accumulation; the landfarming of waste oils; and the effect of evaporative hydrocarbons from road surfaces on roadside flora and crops.

27642 **(RHO-CD—728) Opacity of nitrogen dioxide stack plumes.** Evoniuk, C.J. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). 25 Jun 1979. Contract AC06-77RL01030. 26p. NTIS, PC A03/MF A01. Order Number DE81025137.

Removal of the NO_2 from process off-gases would enable the Purex Plant to comply with the opacity standards for air pollution control. However, a relationship between stack opacity and NO_2 content of the stack gases is needed in order to implement a cost effective NO_2 control method. A test was conducted in which nitrogen dioxide (NO_2) was injected into a 1.3 meter diameter, 150 foot tall stack. Certified visual opacity measurements over a range of 0 to 50 percent were recorded along with the corresponding concentrations of NO_2 in the stack effluent. The visual opacity readings were found to be highly imprecise and from 2 to 3 times higher than opacities calculated on the basis of the light absorption parameters used for smoke opacity meters. Agreement was found between the test readings and visual opacity readings reported on 2.13 and 3.28 meter diameter stack when visual opacity was plotted as a function of NO_2 concentration and effective stack diameter. The difference between calculated and visual opacity is attributed to a color contrast effect which increases the visual noticeability of the NO_2 plume. Calculations based on color contrast show that visual opacity measurements are affected by sunlight conditions and the response of the human eye to color changes. This indicates that a variability in the NO_2 emission limit will exist as long as visual opacity measurements are used as the basis for controlling stack discharges. Based on the analysis of the test data it is recommended that concentration limits rather than visual opacity measurements be used as a criteria for setting stack emissons. Concentration limits corresponding to a visual opacity limit can be determined by the appropriate opacity/ppM meter relationship and a formula which is given.

27643 **Environmental Protection Agency priority pollutants.** Kleopfer, R.D. (Environmental Protection Agency, Kansas City, MO). pp 390-398 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

In the early 1970's the US Environmental Protection Agency began using computerized instrumentation to scan for chemical pollutants in environmental samples. In 1976, because of a court order, the agency began focusing attention on a specific list of 129 chemicals. This paper discusses the background, methodology and quality assurance requirements related to the determination of these 129 priority pollutants.

27644 **Computerized individual particle analyis: a breakthrough in the physical/chemical speciation of atmospheric particulate matter.** Johnson, D.L.; Fortmann, L.; Karcich, K.J.; Hanna, R. (State Univ. of New York, Syracuse). pp 399-405 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Scanning Electron Microscopy, coupled with X-ray Energy Spectroscopy (SEM/XES), is a powerful tool for examining the

physical and chemical characteristics of particles. Through computer control of the system, it is now possible to obtain morphological and chemical information on particles as small as 0.1 μm at rates which are 100 to 1000x faster than can be obtained by hand operation of the instrument. The operation and limitations of computerized SEM/XES are described both for our particular applications and for particle analyses in general. The examples described in this paper relate to the inhalable size range aerosols which have been deposited upon vegetative leaf surfaces.

27645 **Preliminary evaluation of heavy metals in dustfall in the intermountain west region.** Bourcier, D.R.; Sharma, R.P.; Parker, R.D.R.; Drown, D.B. (Utah State Univ., Logan). pp 522-528 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

A number of areas in the Rocky Mountain region are presently in the process of being developed for their coal and oil shale resources. Because of the expected impact of industrial emissions on the environment in this region, there is a need for baseline data on air quality, especially in relation to heavy metal burdens. Wet and dry fallout materials were collected from a total of 43 sampling locations distributed in Idaho, Utah, Colorado and Wyoming over 2 separate collection periods. Dust and corresponding soil samples were analyzed for cadmium, zinc, copper, lead and nickel using either flame or flameless atomic absorption methods. Great variation was found in metal concentrations in dust and soil obtained from the sample locations. There was no significant correlation between dust ad soil metal concentrations at the various sample locations. However, a positive relationship was found between total dustfall deposition rates and deposition rates for Ni and Zn during the collection period of greater precipitation. No similar relationship was observed for samples taken during the period of limited precipitation, indicating that the metal composition of dry fallout is variable for the geographical area monitored.

5003 Radioactive Materials Monitoring And Transport

27646 **(EML—390) Environmental Measurements Laboratory. Environmental report, September 1, 1980-March 1, 1981.** Hardy, E.P. Jr. (Department of Energy, New York (USA). Environmental Measurements Lab.). 1 May 1981. 708p. NTIS, PC A99/MF A01.

This report presents current information from the EML environmental programs, the Air Monitoring Section of the Bhabha Atomic Research Centre in India, the NASA Lewis Research Center and the Radiological and Environmental Research Division at Argonne National Laboratory. The initial section consists of interpretive reports and notes dealing with global movement of radioactive debris from nuclear tests, vertical distribution of short-lived radionuclides in the lower stratosphere at the end of 1980, stratospheric radionuclide and trace gas inventories, plutonium isotopes in stratospheric filtered air, sulfur dioxide measurements in New York City, estimates of lead, manganese, aluminum and iron in atmospheric deposition at American Samoa, chemical composition of deposition at seven US locations, intercomparison of trace element analyses of commercially available reference materials, evaluation of analytical methods for polycyclic aromatic hydrocarbons in sediment, and quality control assessments of radionuclide analyses of surface air filters, biological and deposition samples and of chemical analyses of precipitation. Subsequent sections include tabulations of Sr-90 fallout, chemical constituents of wet and dry deposition, radionuclides and trace metals in surface air, radioactivity and trace gases sampled in the stratosphere by aircraft and balloons, Sr-90 in San Francisco and New York diet, milk and tap water, and Cs-137 in Chicago foods. A bibliography of recent publications related to environmental studies is also presented.

5006 Regulations

REFER ALSO TO CITATION(S) 26813, 27112

27647 (EPRI-WS—79-220(Vol.1), pp 3-14) **Regulatory pressures for increased NO/sub x/ control.** Wyzga, R.E. (Electric Power Research Inst., Palo Alto, CA). May 1981. NTIS, PC A99/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

The significance of impending and likely NO/sub x/ regulations upon the electric utility industry are discussed. These are the consequence of the following five provisions of the Clean Air Act Amendments of 1977: short-term ambient standard of NO_2; Prevention of Significant Deterioration (PSD) for NO_2; legislation to improve and minimize visibility impairment; oxidant control; and acid rain control. The regulations will impact coal-burning power plants most, although synfuel plants can also be significantly impacted. Alternate coal types are not likely to influence NO/sub x/ emissions significantly, but shale oil and coal liquid could yield greater NO/sub x/ emissions than fuel oil. Therefore these regulations could influence fuel choice and the demand for shale oil and synthetic fuels. The regulations could lead to smaller power plants as they may be allowed with existing and inexpensive controls and they may be sited more easily. The impacts of other new laws upon the choice of an NO/sub x/ control technology are also discussed. Before new control technologies are chosen, it must be ascertained that they satisfy regulation in addition to those which they are designed to help meet. A partial list of those regulations which require compliance of new technologies with some minimal level of risk is presented.

27648 (EPRI-WS—79-220(Vol.1), pp 16-34) **Development and revision of air quality standards with special attention to the NO_2 standard review.** Jones, M.H. (Environmental Protection Agency, Research Triangle Park, NC). May 1981. NTIS, PC A99/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

This paper describes the process for review of National Ambient Air Quality Standards. Special attention is given to the issues facing the Environmental Protection Agency in assessing the need for and nature of possible modifications to the NO/sub 2/ ambient air quality standards. The legal requirements for the Clean Air Act Amendments of 1977 are discussed as they apply to this review and to the decision process in making a standard choice. The paper describes not only the importance of the scientific basis for selecting a standard but also the role of the policymaker and the judicial process. Criteria document development, the scientific review process, the preliminary staff position paper and the public review process are all described. Finally, the critical elements in the upcoming NO/sub 2/ standard decision are identified and discussed.

27649 (EPRI-WS—79-220(Vol.1), pp 40-51) **State of California perspective on NO/sub x/ control for stationary sources.** Goodley, A. (California Air Resources Board, Sacramento). May 1981. NTIS, PC A99/MF A01.

In Joint symposium on stationary combustion NO/sub x/ control: proceedings.

The California NO/sub x/ control program is directed toward the achievement and maintenance of air quality standards not only for nitrogen dioxide, but also for ozone, total suspended particulate and visibility. In addition to stringent controls on mobile sources, controls on existing stationary sources and best available control technology (BACT) on new surces are needed in non-attainment areas. In these non-attainment areas, the state is encouraging local districts to adopt controls on refinery boilers and heaters, industrial boilers, gas turbines, stationary I.C. engines, glass plants and cement plants, in addition to existing controls on power plants. The state considers selective catalytic reduction (SCR) to be BACT for most natural gas and oil fired combustion sources, and that (SCR) will be BACT for coal-fired power plants. We also believe that combustion modification techniques can be improved so that SCR may be unnecessary on some sources.

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL

5101 Basic Studies

REFER ALSO TO CITATION(S) 26986, 27632, 27662, 27663, 27810, 27822, 27825

27650 (CONF-800392—(Vol.2), pp 155-173) **Scientific projection paper for ecosystems and environment.** Gustafson, P. Mar 1980. NTIS, PC A22/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

The pervasiveness of concern about ionizing radiation in the public mind stems, in considerable measure, from a lack of understanding about the behavior, fate, and presumed effects of radiation-emitting elements. This lack of understanding also is applicable to the standards and guidelines which are used to regulate the quantities of radionuclides which may be released to the environment. Radioecological research on the transport, movement, and effects of ionizing radiation is needed to verify the validity of the standards for release and to eliminate the potential errors that currently exist in assessing dose to human populations due to uncertainties in the environmental transport of radionuclides in terrestrial and aquatic ecosystems. We believe that the public concern over the impact of ionizing radiation (and therefore nuclear energy) could be alleviated considerably by directing more of our radiobiologic research effort to scientific questions related to standards and standard setting.

27651 **Phenotypic and genotypic components of growth and reproduction in Typha latifolia: experimental studies in marshes of differing successional maturity.** Grace, J.B.; Wetzel, R.G. (Michigan State Univ., Hickory Corners). *Ecology ;* **62**: No. 3, 789-801(Jun 1981).

The objective of this study was to separate the genotypic and phenotypic variation in biomass allocation for populations of Typha latifolia from habitats of differing successional maturity. Field studies revealed that the OPEN marsh population of T. latifolia suffered high levels of ramet mortality over winter and had rapid growth in ramet numbers during the growing season. In contrast, the WOODS marsh population suffered predominantly from growing-season mortality with little ramet death over winter. The CATTAIL marsh population was intermediate in mortality patterns to the other two populations. Tissue nutrient analyses and fertilization experiments revealed that T. latifolia in the OPEN marsh was principally nutrient limited while T. latifolia in the WOODS marsh was light limited. The CATTAIL marsh population was exposed to conditions of nutrients and light intermediate to other populations.

27652 **Drainage of organic soils as a factor in the world carbon cycle.** Armentano, T.V. (Inst. of Ecology, Indianapolis, IN). Contract 79E10040.000. *Bioscience ;* **30**: No. 12, 825-829(Dec 1980).

Wetland ecosystems throughout the world have stored carbon in organic soils since the earliest geological record, and particularly since the last glacial retreat 10,000 or more years ago. Evidence suggests now, however, that widespread clearing and draining of organic soils, principally for agricultural production, may be causing oxidation of enough carbon to add significantly to the rise of CO_2 in the atmosphere. This paper will assess the available data on the world's wet organic soils in relation to the global carbon cycle and estimate the consequences of drainage for the global carbon exchange of these soils.

27653 **Geochemical modeling: apparent solubility controls on Ba, Zn, Cd, Pb and F in waters of the Missouri tri-state mining area.** Jenne, E.A. (Pacific Northwest Lab., Richland, WA); Ball, J.W.; Burchard, J.M.; Vivit, D.V.; Barks, J.H. pp 353-361 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Past lead and zinc mining activity has resulted in large flooded mines and more than 1000 hectares of tailings piles near Joplin, MO. Samples of surface and ground waters from this area were analyzed for pH, alkalinity, major elements, selected minor elements, Fe(II), and Fe(III). Aqueous speciation and disequilibrium solubility indices were computed with the geochemical model, WATEQ2. Good evidence exists for solubility controls on 3 elements (Ba, Zn and Cd) and possible controls were identified for 2 others (Pb and F). Barite ($BaSO_4$) appears to control the solubility of Ba in all the waters, including the storm drainage. All barite disequilibrium indices, except those from 4 undersaturaed well waters, fall within the +- 0.5 log unit error band. The carbonate salts appear to effectively place an upper limit on the dissolved levels of 2 toxic metals, Zn and Cd, as well that of Ca, in all waters except the acidic (pH 3.5 to 4.8) drainage from the tailings piles themselves. Numerous water samples are undersaturated with respect to the Zn and Cd minerals examined. For Pb, the carbonate salt may occasionally limit its dissolved concentration; precipitation of the sulfate salt would prevent large increases in soluble Pb, but sensitivity analyses, using the available PO_4 analyses, suggest that PO_4 may serve as a possible limit to the solubility of Pb in these waters. The dissolved F level is primarily limited by its availability; however, a few of the waters with the highest conductivity values are near solubility equilibrium with fluorite.

5102 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 27645, 27678, 27682, 27685, 27760, 27769, 27772, 27773, 27774, 27777, 27783

27654 **Rapid in situ hydrolysis and retention of decomposition products of organophosphorus compounds by reaction ion exchange beds.** Janauer, G.E.; Costello, M.; Stude, H.; Chan, P.; Zabarnick, S. (Army Armament Research and Development Command, Aberdeen Proving Ground, MD). pp 425-435 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Reactive ion exchange (RIEX) on small resin beds was previously employed for the preconcentration/isolation of inorganic trace species using reduction/oxidation, complexation, neutralization and precipitation reactions. Industrial applications of ion exchange materials include acid-catalysis of organic reactions. Recent results obtained in these laboratories demonstrate that reactions of various organics with strong nucleophiles (such as hydroxide ion) can be effectively performed with the reactive species introduced on ion exchange resins: the in situ degradation of organic pesticides subject to nucleophilic attack proceeds very rapidly when a strongly nucleophilic counter-ion is delivered from a suitable exchanger. Thus, rapid decomposition/removal of organophosphorus pesticides and presumably other pesticides including carbamates, can be accomplished by simply passing their solutions through a strong base resin bed in the free OH^- form. Batch rate studies with 2 model compounds yielded pseudo first-order constants, k/sub obs/, quite similar to the corresponding constrants for analogous solution reactions. Results of column experiments suggest that RIEX detoxification of many widely used, enzyme-blocking pesticides may become a practical method for the decontamination of pesticide-polluted drinking water and for safe chemical disposal of pesticide residues.

27655 **Movement of sewage microorganisms in soils.** Liu, D.; Kwasniewska, K. (National Water Research Inst., Burlington, Ontario). pp 464-469 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Three anaerobically digested, chemically-treated sewage sludges (alum, iron and lime sludges) were applied to lysimeters containing silt loam or loamy sand at 3 different rates (expressed as 500, 1000 and 1500 kg TKN/hectare), each with 3 replicates. One year after application, soil cores were collected from the lysimeters receiving the highest rate of sludge application at depths of 2.5, 7.6, 15.2, 25.4 and 61.0 cm, using a soil auger. The individual cores were subsectioned and examined for populations of heterotrophic bacteria, total coliform, fecal coliform, fecal streptococccus and

fungi. It was found that after one year of heavy sludge application (1500 kg TKN/hectare) 95% of the sewage microorganisms were found still in the top 15 cm of soils. Thus it appears that sewage sludge land disposal would pose very little, if any significant contamination of underground water by sewage microorganisms, provided the land is not overloaded.

27656 **Agricultural implications of Zn and Cd contaminated land at Shipham, Somerset.** Matthews, H.; Thornton, I. (Imperial Coll., London, England). pp 478-488 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Agricultural soils in the vicinity of Shipham, Somerset contain highly elevated amounts of zinc and cadmium as a result of mining activities in the 18th and 19th centuries. Lead is also present in large amounts. Metal uptake by pasture herbage has been examined on a seasonal basis. Marked differences have been observed in the metal contents of pasture grasses and weed species. Differences in Zn/Cd and Zn/Cu ratios have also been found between species. Percentage extractability of Cd with N NH_4 Ac is 20 times greater than that of Zn. Fecal analysis has indicated that soil ingestion is an important pathway of Cd, Zn and Pb to grazing cattle.

5103 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 26903, 26905, 26908, 26927, 27650, 27828

27657 **(DOE/DP/01253—20) Radiological characterization of the Kellex site. Publication No. 45020.** Hutchinson, S.W. (Nevada Univ., Reno (USA). Water Resources Center). Mar 1981. Contract AC08-76DP01253;AC08-81NV10162. 78p. NTIS, PC A05/MF A01. Order Number DE81026316.

A radiological characterization has been conducted at the former Kellex Corporation site in Jersey City, New Jersey. Although several prior surveys and a remedial action were conducted, there was still a need for more information about the radiological condition of the site. A grid was established on the site and the surface was surveyed by a mobile in situ detection system. Trenches were systematically dug in an attempt to find subsurface areas of contamination. Material from the trenches was surveyed by the in situ measurement system and trench sidewalls were soil sampled and surveyed using portable dose rate and count rate instrumentation. Results of the survey indicated that radioactivity levels on the site were at or near background. Small amounts of contaminated material were found but not enough to exceed the guideline specified.

27658 **(EGG—1183-1795) Surface and subsurface gamma survey of the Kellex Site, Jersey City, New Jersey: dates of survey, September 8-November 11, 1980.** Fritzsche, A.E. (EG and G, Inc., Las Vegas, NV (USA). Energy Measurements Group). Apr 1981. Contract AC08-76NV01183. 24p. NTIS, PC A02/MF A01. Order Number DE81027221.

The Kellex Site of about 6.2 hectares in Jersey City, New Jersey was surveyed by an in situ gamma measuring system. The system consisted of a high purity germanium detector and electronics mounted on a tracked vehicle. The entire site was surveyed on a 20 meter grid that may be transformed to New Jersey grid coodinates. A fraction of the site was surveyed on a 5 m grid. The subsurface soil was surveyed to a 1 m depth by means of a trenching operation that brought the subsurface soil to the surface. The in situ gamma data were converted to activity concentrations of uranium, thorium and potassium in the Kellex soil. Individual measurements were compared to the mean site concentrations to ascertain those areas that differ significantly from the mean. Only ^{238}U and ^{235}U appear to exist at Kellex in significant excess of the Kellex means, which in turn approximate New Jersey natural concentrations. No Kellex soil appears to exceed the investigative guideline for ^{238}U of 40 pCi/g in a 400 m^2 area 20 cm thick.

5105 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 26798, 26799, 26926

5106 Regulations

REFER ALSO TO CITATION(S) 26813

52 ENVIRONMENTAL SCIENCES, AQUATIC

5201 Basic Studies

REFER ALSO TO CITATION(S) 26977, 27652, 27653, 27808

27659 **(DOE/EV/05163—4) Measurement of Gulf-Stream and wind-induced shelf circulation in the South Atlantic Bight. Progress report, June 1, 1980-May 31, 1981.** Lee, T.N. (Miami Univ., FL (USA). Div. of Meteorology and Physical Oceanography). Feb 1981. Contract AS05-76EV05163. 209p. NTIS, PC A10/MF A01. Order Number DE81024387.

During the period June 1, 1980 to May 31, 1981 the investigation of physical processes on the Georgia continental shelf was focused on processing and analysis of existing data sets as well as conducting the Georgia Bright Experiment (GABEX-1) and processing the recovered records. We have completed processing of long-term current/temperature/pressure records collected during 1976 to 1979 from the mid- and outer-shelf region off Savannah and have intercompared these data to BLM data sets from Cape Romain. Processing of the GABEX-1 outer shelf mooring data was also completed, and analyses were begun.

27660 **Paleoecology of Hall Lake, Washington: a history of meromixis and disturbance.** Culver, D.A. (Ohio State Univ., Columbus); Vaga, R.M.; Munch, C.S.; Harris, S.M. *Ecology ;* **62**: No. 3, 848-863(Jun 1981).

Hall Lake, Washington, has been meromictic and holomictic for known periods in the recent past (1950 to 1980). Information on the factors initiating biogenic meromixis in Hall Lake, Washington, was sought using an analysis of the recent sediment in conjunction with known historical events. X-rays of six 50-cm cores showed cryptic laminations that proved to be varves resulting from winter rains, which concentrated silt and clay input in that season. Precise estimation of annual sedimentation rates over the past 350 yr permitted calculations of fluxes of total mineral matter, organic matter, Fe, Ca, Na, K, Pb, Si, Al, Mg, Ti, S, P, chlorophyll degradation products, and cladoceran microfossils. The relative abundance diagrams for pollen and major diatom taxa were also constructed. The sedimentary record left during the known period of meromixis (1950 to 1962) was characterized by mesotrophy, stable mineral flux rates, moderate algal production, stable organic fluxes, and relatively low sedimentation rates, implying insignificant influx of silt-laden waters during winter when meromictic stability is minimal. The absence of sapropel in the sediments during the meromictic era suggests that sapropel is more characteristic of anoxia and adequate Fe and S than of incomplete winter circulation. A change was documented from Daphnia rosea to Daphnia pulex associated with the destruction of meromixis in 1963.Similarly, major changes in the flux of Daphnia rosea and Bosmina longirostris microfossils to the sediments in the lower portion of the core are as yet unexplained. An attempt to study the population dynamics of Daphnia rosea based on size-frequency distributions and using a computer model demonstrated that there is a systematic underrepresentation of the smaller instars preserved in the sediments, making such studies impossible.

27661 **In situ calibration of a sediment trap.** Lorenzen, C.J.; Shuman, F.R.; Bennett, J.T. (Univ. of Washington, Seattle). Contract DE-AT06-76-EV-75026; DE-EV-75026-82. *Limnology and Oceanography ;* **26**: No. 3, 580-585(May 1981).

A relatively small self-contained sediment trap with a timed closing system was deployed in Dabob Bay, Washington, for 1

year. Samples were collected representing 326 trap exposure days. An in situ calibration was obtained by comparing the capture and retention of unsupported ^{210}Pb by the traps with the steady state accumulation rate of unsupported ^{210}Pb in the underlying bottom. The efficiency of the traps to collect a representative sample of the sedimenting material is 118%.

27662 **Ground-water use for cooling: associated aquifer temperature changes.** Lippmann, M.J.; Tsang, C.F. (Univ. of California, Berkeley). *Ground Water ;* **18**: No. 5, 452-458(Sep 1980).

In steam-electric power plants, large volumes of surface waters are used for cooling the plant's condensers. There, approximately two-thirds of the energy produced by the fuel is removed as waste heat. This heat is carried away by the cooling waters, is dispersed into the atmosphere or surface-water bodies, and is lost for other potential uses. When condenser cooling systems such as towers or ponds are used, there is also a considerable net loss of water through evaporation. Injection and storage of spent cooling waters underground would reduce the evaporative (consumptive) losses to the atmosphere. Later, these waters could be recovered for use in heating and in industrial or agricultural applications. The resulting conservation of energy and water may make such a project economically feasible in the near future as the costs of water and fuel increase. In this paper, we review the use of ground water from a confined aquifer for this application and analyze a simple configuration of one withdrawal and one injection well to determine: (1) the areal extent of temperature changes caused by reinjection of spent cooling waters into the aquifer from which they originated; and (2) how long it would take for the water to become too hot to use for cooling.

27663 **Water quality in the lower Paleozoic aquifers of the Tri-State area.** Hathaway, L.R.; Macfarlane, P.A. (Kansas Geological Survey, Lawrence). pp 148-154 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Striking changes over relatively short distances occur in the chemical quality of groundwaters from lower Paleozoic aquifers serving municipalities, rural water districts and rural domestic wells in southwestern Missouri, southeastern Kansas and northeastern Oklahoma. A general transition in the study area from Na-Cl type waters in the west to Ca-HCO_3 type waters in the east is complicated by the presence of H_2S westward from the transition zone and by the occurrence of Na-HCO_3 type waters in the northern portions of the transition zone.

27664 **Atmospheric trace gases in association with sea ice.** Gosink, T.A. (Univ. of Alaska, Fairbanks). *Antarctic Journal of the United States ;* **15**: No. 5, 82-83(1980).

Unlike glacier ice, sea ice permits the slow but significant exchange of gases through it. This information is important in climate modifications models. Decay and photosynthetic activity in and immediately under the sea ice produce the trace gases. The relatively large-grain boundary and brine channels in sea ice are the pathways of the trace gas exchange between sea ice and the atmosphere.

27665 **Multiple linkages of forests to streams.** Cummins, K.W. Contract AT06-79EV10004. pp 191-198 of Forests: fresh perspectives from ecosystem analysis. Waring, R.H. (ed.). Corvallis, OR; Oregon State University Biology Colloquim (1980).

Headwater stream ecosystems in forested watersheds are intimately related to their vegetative setting. The riparian zone, the source area of soil-forest products which enter the stream, contributes to channel stability and generates biologically active organic substrates. Large woody debris often constitutes stable geomorphic features which retain mineral sediment and finer organic material. Inputs of organic solutions and paticulates (and inorganic nutrients) provide energy for the stream community over an annual cycle. The stream also represents a potential source area for the riparian zone of the forest ecosystem at times of greater than bankfull discharge. Thus, because of the interactive nature of forest-stream ecosystems, stream community structure and function should be studied within a watershed context.

27666 **Ecology of a submarine petroleum seep off the California coast.** Spies, R.B.; Davis, P.H.; Stuermer, D.H. Contract W-7405-ENG-48. pp 229-263 of Marine environmental pollution. Volume I. Hydrocarbons. Geyer, R.A. (ed.). Amsterdam, Netherlands; Elsevier Scientific Publishing Company (1980).

The initial two years of this study dealt with population and community fluctuations of benthic organisms in both seep sediments and in a nearby comparison area. Next, based on these results and other observations, hypotheses were formulated to explain the abundant communities of organisms living in sediments with ≧ 10,000 ppM of petroleum. In the third year, three hypotheses relating to organic enrichment, adaptation and seep toxicity were developed. These form the continuing basis of our study.

27667 **Natural stream ecosystem.** Cummins, K.W. (Oregon State Univ., Corvallis). pp 7-24 of Ecology of regulated streams. Ward, J.V.; Stanford, J.A. (eds.). New York, NY; Plenum Publishing Corporation (1980).

In the past decade, theory of stream ecosystem structure and function has come to emphasize the origins and fates of organic resources and inorganic nutrients in running waters, which are viewed as subsystems of their watersheds or drainage basins. Lotic research, conducted on isolated reaches without a spatial-temporal perspective of general watershed processes, has often proven too narrow ton be of extensive use either for the development of theory or management application. Stream order, geomorphic and vegetational setting, and the annual hydrograph pattern exert important controls on biological function. Studies of detritus dynamics in headwater streams have shown the importance of organic inputs from the riparian zone. Management of the riparian zone exerts a major control on headwater streams, and such management of headwaters is a primary ingredient in the maintenance of community structure of larger receiving streams and rivers in a drainage net.

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REFER ALSO TO CITATION(S) 26800, 26802, 27771, 27773, 27774, 27784

27668 **Time history of trace elements in sediments from Standley Lake, Colorado.** Heit, M.; Klusek, C.S.; Volchok, H.L.; Burke, J.C. (DOE Env Measurements Lab, New York City). *Environment International ;* **4**: No. 3, 229-237(1980).

Eighteen trace elements in sections from a 50 cm long sediment core from Standley Lake, Colo., were analyzed. The core was dated by the use of bomb-produced cesium-137. Ten of the elements measured appear to be enriched in the sediment; these include cadmium, copper, mercury, and zinc. Seven others are probably of local origin: aluminum, arsenic, beryllium, cobalt, chromium, nickel, and vanadium. Tellurium was not detected. The primary source of the excess elemental concentrations is local stream pollution.

27669 (DOE/EV/04047—T1, pp 1.1-1.14) **Introduction, background and program description.** Wilson, M.P. Jr. Dec 1980. NTIS, PC A99/MF A01.

In Assessment of treated vs. untreated oil spills. Final report.

The approach in this program has been to attempt to mimic the natural weathering and entrainment processes and to expose the organisms to varying concentrations from lethal to minimal sublethal dosages and to study predator-prey relationships under these conditions. The program was divided into three major but integrated groups, one to study entrainment and evaporation processes, a biological group including microbiology to study the effects of treated oil versus untreated oil on selected marine organisms and oil degradation rates and a third group to provide the chemical analysis. Laboratory type tests were conducted by each group to study some of the fundamental processes, however, all groups participated in the combined tests conducted in the meso-scale facilities as described in the next section. Spills of opportunity provided experimental data to correlate with meso-tank results. The results of this program describe an approach to estimate the environmental impact of an untreated oil spill versus a spill treated with dispersant. It is holistic, in that it combines the physical, chemical, microbial and

macro-fauna responses to a spill. The results reported herein represent the findings of a four year effort that integrates mathematical, laboratory, meso-scale in-situ experiments and analyses.

27670 (DOE/EV/04047—T1, pp 2.1-2.30) **Effect of chemical dispersants on the stability of oil water emulsions.** Cherian, M.; Kim, T.J. Dec 1980. NTIS, PC A99/MF A01.

In Assessment of treated vs. untreated oil spills. Final report.

The basic question posed in this investigation was whether it was desirable to use a dispersant for emulsifying crude oil for later biogradation. The series of experiments conducted show that crude oil can be effectively dispersed using a commercial dispersant, Corexit 9527 without excessive power input. The interfacial area and the hold-up, which are the important parameters when considering biodegradation was found to be 2 to 3 times that when no dispersant was used.In this context it is important to remember that not all dispersants are useful for the purpose of biodegradation. It was found that oil could enter the water column even when there was no power input. The drop size distribution found for the 1 to 12 micron range can be considered to be truly representative of the emulsion. Further, this range of droplets is all that is necessary to study the emulsification process and the stability of oil-in-water emulsions. It was observed that coalescence in a system of such a small hold-up as parts per million is very small. Therefore the instability of the system is due to the upward movement of the droplets in the continuous phase. This movement becomes ever smaller as the drop diameters become smaller. It is hoped that it will be possible to translate the experimental data at the higher temperatures. Interfacial tension is the most dominant factor that is affected by the temperature. A decrease in the temperature from 22 C to 5 C increases the interfacial tension approximately by a factor of 2 to 3. Since the work done and consequently the power input is a linear function of temperature, it is expected that an increase in interfacial tension by a factor of 1.1 would call for an increase in the power input by the same factor.

27671 (DOE/EV/04047—T1, pp 3.1-3.62) **Effect of wind and wave motion on oil entrainment.** Dec 1980. NTIS, PC A99/MF A01.

In Assessment of treated vs. untreated oil spills. Final report.

The intent of the experimental test program was to investigate the relationship between the amount of any given oil dispersed into the water column from a slick on the surface, and the macroscopic physical properties of the waves causing the dispersion. Of particular interest were the effects of any oil property changes on the oil in water concentrations as the oil weathers. Consequently, the experiment was designed toward this end. No attempt was made, for example, to perform detailed investigations of the turbulent structure in the breaking waves, or to test for chemical changes in the oil. Rather, a simple function between sea-state and oil concentration was assumed to exist. The major effort was devoted to measuring the important parameters that would be included in this function such as the oil concentrations in the tank, and the wave parameters including an estimate of the frequency and extent of wave breaking. Other parameters that were deemed peculiar to the experiment, such as the induced water currents, that might affect any generalizations from the data were also measured. Oil properties and water properties were only measured to establish baselines and were not investigated for changes. The presumed function is certainly an approximation which ignores many components of the problem. However, the observations and data suggest that this assumption may be valid.

27672 (DOE/EV/04047—T1, pp 4.1-4.59) **Entrainment of oil in the water column.** Persen, L.N. Dec 1980. NTIS, PC A99/MF A01.

In Assessment of treated vs. untreated oil spills. Final report.

The entrainment process as regards the dispersion of oil spills by wave and wind action is described. The recirculating motion in the ocean and its ability to trap the droplets which are being produced is investigated. The paths of oil droplets in the ocean are also investigated. Three different experiments pertaining to the entrainment are described: the wind-wave experiment; the drop-size experiment; and the rain-drop experiment. (DMC)

27673 (DOE/EV/04047—T1, pp 5.1-5.22) **Sample application of the oil spill model: Georges Bank oil spill simulations.** Cornillon, P.C.; Spaulding, M.L.; Hansen, K. Dec 1980. NTIS, PC A99/MF A01.

In Assessment of treated vs. untreated oil spills. Final report.

In this section, the use of the oil spill fates model is described as a tool to analyze the effect of various treatment strategies on the fate of a simulated spill. The location of the spill was chosen at the center of the Cod spawning region on Georges Bank and at a time, mid-winter, to affect a maximum impact on the Cod fishery. The output of the model resulting from these simulations was used as input to a fisheries model. The size of the spill, 34,840 metric tons, as well as its duration, 39 hours, or spill rate, about 900 metric tons per hour were chosen to correspond approximately to the Argo Merchant spill which occurred on Nantucket Shoals in December of 1977. The type of oil selected was a No. 2 like fuel oil. Five different treatment scenarios were analyzed. The oil model has been designed to follow the dispersed oil, and the surface slicks as well as to present the output in a convenient easy to understand graphical format. The five treatment scenarios examined in this section consist of one case in which no treatment was performed and four cases in which various fractions of the oil remaining on the surface were assumed to be driven into the water column, specifically, 25%, 50%, 75% and 100%. All treatment was assumed to take place 48 hours after the spill began, or approximately 9 hours after the last oil had leaked from the source.

27674 (DOE/EV/04047—T1, pp 6.1-6.20) **Fishery oil spill interaction model.** Spaulding, M.L. Dec 1980. NTIS, PC A99/MF A01.

In Assessment of treated vs. untreated oil spills. Final report.

The oil spill - fisheries impact model has been used to simulate nine variations of an oil spill scenario on Georges Bank, producing a rough sensitivity analysis of system response. Following an overview of the model system, the results and implications of these simulations are discussed along with limitations of the approach used. It is suggested that the most significant unknowns in the system are the parameters governing recruitment dynamics in the fishery, toxicity threshold values and oil entrainment rates being of secondary importance in open ocean conditions.

27675 (DOE/EV/04047—T1, pp 7.1-7.175) **Chemical analysis of oil spills.** Brown, C.W.; Ahmadjian, M.; Lynch, P. Dec 1980. NTIS, PC A99/MF A01.

In Assessment of treated vs. untreated oil spills. Final report.

The overall objective of the project is to assess the environmental impact of a chemically treated vs. an untreated oil spill. The primary compositions of petroleum chemicals in the atmosphere, surface waters, water column and sediments, resulting from a treated and untreated spill. To meet this objective, it was necessary for the group to develop sample collecting, extraction, and chemical analysis methods. In addition, extensive development and testing of computer software was undertaken to collect and message the analytical data. Laboratory experiments were designed and executed to aid in the development of these analytical techniques. Results from the laboratory studies determined the techniques which would be applied to the analysis of the meso scale experiments and eventually to any real world spills of opportunity.

27676 (DOE/EV/04047—T1, pp 8.1-8.39) **Microbiology.** Traxler, R.W. Dec 1980. NTIS, PC A99/MF A01.

In Assessment of treated vs. untreated oil spills. Final report.

This project was designed to investigate the effect of chemical dispersants on the ability of natural marine bacterial populations to biodegrade crude oil hydrocarbon components. It is concluded that hydrocarbon degradation potential in nutrient limited seawater is a relatively constant value independent of the presence or absence of oil in the water column. There is selection for hydrocarbanoclastic bacteria with time but their overall degradation activity as a mixed population is not significantly affected by the enrichment process. Preliminary evidence indicates that nutrient supplements (nitrogen, phosphorus and iron) do have a significant effect on the size of the seawater microbial population and yield a rather homogenous population of hydrocarbon utilizing bacteria in the presence of oil. Natural microbial hydrocarbon degrative processes are active in the water column of dispersed or non-dispersed oil. These processes will eventually lead to the turnover of the biode-

gradable oil components. The rate at which oil degradation occurs is not materially enhanced by the dispersion process but dispersion of the oil into small micelles (1 to 2 μm) suspended in the water column does make the oil available to microbial action in the water column. Due to the physical inaccessibility of microorganisms to the bulk of the oil in a heavy slick, dispersion of the oil is an adjunct to the hydrocarbon degradative capacity of a mixed natural marine water column population. Limited data from this project indicates that hydrocarbon degradative potentials in sediments and the surface microlayer may be significantly higher than degradative potentials in the water column. (DMC)

27677 (DOE/EV/04047—T1, pp 9.1-9.32) **Biological investigations.** Ordize, C.J.; Garofalo, G. Dec 1980. NTIS, PC A99/MF A01.

In Assessment of treated vs. untreated oil spills. Final report.

The information from our research efforts is presented in three major sections, each dealing with and answering questions about related but different aspects of the scallop predator-prey system and the impact of oil and dispersant on this system. In Section (9.1), the actual bioassay experiments are described. Sections (9.2) and (9.3) present our biological investigations and techniques which form a foundation for all of the sublethal bioassay work. In Section 9.4, the response of a simple predator-prey community to oil, dispersant, and oil-dispersant mixtures. Investigations of short term acute exposure of bay scallops, Argopecten irradians and two scallop predators, the oyster drill Urosalpinx cinerea and the common starfish Asterias forbesi, to oil, dispersant, and oil-dispersant mixtures (Kuwait Crude Oil and Corexit 9527) suggested that predator and prey have different lethal susceptibilities. Treatment had less effect on predators than on scallops at summer temperatures. Sublethal concentrations of dispersant and oil-dispersant mixtures diminished the behavioral ability of scallops to recognize drills and starfish. The degree of effect increased with temperature. Predator detection of prey at the same concentrations was more complex. The feeding response or posturing reflex of starfish was significantly slowed by all treatments. In contrast, drills were unaffected in their recognition of scallop effluent in a choice chamber after treatment. Although temperature had little effect on predator recognition, scallops required more time to respond to predators at 12°C than at 20°C. Once initiated, escape responses appeared to be temperature independent. It would seem predator recognition contributes to an efficient time-energy budget.

27678 (DOE/TIC—11470) **Fuel conservation by the application of spill prevention and failsafe engineering: a guideline manual.** Goodier, J.L.; Siclari, R.J.; Garrity, P.A. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jun 1981. Contract AC06-76RL01830. 332p. NTIS, PC A15/MF A01. Order Number DE81026036.

This manual was developed to provide guideline information on spill prevention procedures for individuals who have the responsibility of maintaining a spill-free plant during the transportation, transfer, storage and processing of petroleum products. The manual can, however, be used to prevent spills of materials other than fuel oil. An attempt was made to cover every facet of spill prevention. Special emphasis is given to failsafe engineering as an approach to preventing spills from the predominant cause - human failure.

27679 Analytical model of photosynthetic response of aquatic plants to inorganic carbon and pH. Weber, J.A.; Tenhunen, J.D.; Westrin, S.S.; Yocum, C.S.; Gates, D.M. (Univ. of Michigan, Ann Arbor). *Ecology ;* **62**: No. 3, 697-705(Jun 1981).

A model is described for the response of net photosynthesis to inorganic carbon concentration in aquatic plants. This model is a modification of the model for terrestrial plants by Tenhunen et al. and Tenhunen et al. An attempt has been made to incorporate into the model HCO_3^- fixation as well as the increase of internal O_2 concentration during photosynthesis and its effect on photorespiration. Factors controlling fixation of inorganic carbon are described in terms of supply of fixable carbon, fixation mechanics, and diffusion resistance to absorption of inorganic carbon. Inorganic carbon supply is the available carbon pool at a distance from the plant where the concentration is unchanged by activities of the plant. Carbon fixation rate is assumed to follow Michaelis-Menten type kinetics with O_2 acting as a competitive inhibitor. Diffusion of free CO_2 to the site of fixation is described by Fick's Law. Transport of HCO_3^- is assumed to be controlled by a transport system which follows first-order Michaelis-Menten kinetics. Photosynthetic rate data of Raven on Hydrodictyon africanum and Lucas on Chara corallina are successfully simulated (r between .87 and .99, significant at P = .01).

27680 Climatological oil spill planning guide. No. 2. Gulf of Maine/Georges Bank. Bishop, J.M.; Harrigan, D.; Mello, V. Washington, DC; Federal Emergency Management Agency (1981). 185p. (NP—1903610).

Oil spills are a major concern in both offshore oil production and oil transport at sea. For an effective oil spill contingency plan to be formulated, one needs relevant environmental data. The objective of this study is to provide such information in a format that can be understood and used by decision makers in oil spill contingency planning and by scientific support personnel during actual spills. The concept that a report of this type should be available was initially developed during the grounding of the Argo Merchant. At that time it became apparent that there was no source of key climatological data available for pre-spill planning and post-spill mitigation purposes. This planning guide discusses the movement of oil at sea, presents relevant environmental data, and predicts the possible impact of oil spills on the marine environment. The hope is to provide the necessary environmental information to help mitigate adverse effects in the event of a major oil spill. The guide can also be used for spills of other types such as hazardous chemicals, since many of the governing environmental processes and impacted resources would be the same. This report is the second in a series designed to cover all US Regional Response Areas. The first planning guide covered the New York Bight (Coastal Region II); this report is for the Gulf of Maine/Georges Bank (Coastal Region I).

27681 Effects of geothermal effluents on aquatic ecosystems. Cushman, R.M.; Barnes, D.W.; Craig, R.B. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Environment International ;* **4**: No. 3, 209-216(1980).

The use of geothermal energy for electrical generation and a variety of other purposes requires the handling and disposal of large volumes of geothermal fluids. These fluids contain constituents such as dissolved ammonia, hydrogen sulfide gas, and trace elements. Facilities in the United States are not expected to routinely discharge large volumes of toxic geothermal fluids. However, chronic effects on aquatic ecosystems are possible at concentrations where acute toxicity would be neither expected nor observed. Also, some trace elements may accumulate to hazardous levels in ecosystems, even when released at nontoxic concentrations.

27682 Selenium content and speciation in environmental waters determined by X-ray fluorescence spectroscopy. Robberecht, H.; Van Grieken, R. (Univ. of Antwerp, Wilrijk, Belgium). pp 362-366 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

The tetravalent and hexavalent selenium content of different environmental water types can be determined with high sensitivity and specificity by conventional energy-dispersive x-ray fluorescence after a suitable preconcentration step. 1-Ascorbic acid specifically reduces selenite into elemental Se, which can be efficiently adsorbed onto activated carbon. Refluxing the water samples with thiourea in sulfuric acid medium reduces both selenite and selenate, hence subsequent adsorption on activated carbon and analyzis give the total dissolved Se content. The suspended matter can be analyzed separately. The selectivity of the different procedures vs. the different species of Se were experimentally examined. Results are outlined for numerous analyses of river water, estuaries, the North Sea, rain, snow, cold and hot springs, swimming pools, and bottled and drinking water. With few exceptions the results are quite low, ranging from the detection limits up to 1 $\mu g\ l^{-1}$. In drinking water, swimming pools and geothermal springs, the Se(VI) appears to be the predominant species. In a polluted river, its estuary and the adjacent North Sea, Se is mostly present as Se(IV). This speciation is compared to literature data.

27683 **Field analysis of ten parts per billion trichloroethylene in water, using a portable, self-contained gas chromatograph.** Rock, J.C.; Post, J.A. (Occupational and Environmental Health Lab, Brooks AFB, TX). pp 367-374 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

A procedure is described which permits rapid field analysis for trace amounts of trichloroethylene (TCE) in recreational or drinking quality water samples. The water sample is sealed into a container with an equal volume of headspace air and shaken for 60 seconds to establish equilibrium conditions. A small aliquot of headspace air is withdrawn and injected into a Century Systems Model 128 Organic Vapor Analyzer. This portable, self-contained, flame ionization gas chromatograph, equipped with an analytical column made from 10% SP 2100 on Supelcoport 60/80 mesh packing in one-eighth inch aluminum or teflon tubing, provides adequate separation with a 24-in column length at 25°C or 9-in column length at 0°C, and a 12 ml/min hydrogen carrier gas flow rate. The field analysis is based upon the height of the TCE peak, which elutes about 3 min after injection. After the peak elutes, the column is backflushed for 5 min before the next sample is injected. A clearly discerned peak of 4% of full scale is obtained from prepared standards containing 5.8 ng/ml TCE in water.

27684 **Heavy metal distribution in particles from the flocculent sediments of Onondaga Lake, NY.** Effler, S.W. (Syracuse Univ., NY); Johnson, D.L. pp 489-499 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Onondaga Lake, located in metropolitan Syracuse, NY, receives extensive industrially derived heavy metal loadings. Despite the diluting influence of high sedimentation rates, bulk analyses indicate the upper sediments are extremely contaminated with Cr, Ni, Cu and Zn. More than 10,000 particles from the upper flocculent sediments were analyzed by computer-controlled Scanning Electron Microscopy, coupled with x-ray Energy Spectroscopy, to identify and characterize heavy metal associations within the solid phase. The heavy metals Cr, Ni, Cu and Zn were present in approximately 14% of the particles analyzed. Heavy metals contributed less than 10% of the emitted X-rays in the vast majority (95%) of these particles. The major chemical constituents of the analyzed particles were Si, Ca, Al, Fe and S. Only minor differences in the dominant chemical composition of the 4 heavy metal bearing populations were apparent. The presence of the heavy metals in particles was not found to be preferentially associated with certain particle sizes, though higher concentrations tended to be associated with particles of less than 1 μm. The relative concentration of Ca increased in the larger particle fractions, including those containing the 4 heavy metals. The continued coating of existing particles, including those containing heavy metals, with calcite is presented as a possible explanation for these observations.

27685 **Geochemical investigation of Cd, Pb and Zn in waters and sediments of the River Gannel, Cornwall.** Thorne, L.T.; Metcalfe, A.; Thornton, I. (Imperial Coll., London, England). pp 500-506 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

A detailed study of the River Gannel has been undertaken to determine the mobility and transport of metals derived from mine waste and adit drainage. On-site filtration techniques have been developed to quantify filterable and particulate phases of metals in the water. Three major zones have been recognized on the basis of metal inputs and dispersion characteristics: (1) an upper zone where acid leachate from mine waste provides a major source of metals to the systems; (2) a middle zone where metals enter mainly in solution and particulate phases in acid mine drainage; (3) a lower zone where water at neutral pH flows over a bed rich in mine waste. Concentrations of metals in waters decrease downstream due to dilution and to scavenging by reactive sediment material. Sediments are heavily contaminated with metals throughout the system.

27686 **Polynuclear aromatic hydrocarbons in trickling water and sewage.** Rump, H.H. pp 507-515 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Polynuclear aromatic hydrocarbons (PAHs) are an important class of organic compounds which can be found in the entire environment. The carcinogenic activity of some PAHs is very high so that thorough knowledge of their environmental behavior is necessary. For investigations in aquatic systems, trickling filters filled with quartz sand and gravel were fed with a mixture of selected substances. Distinct differences between the filter types could be observed and also between the different PAHs. One of the reasons for concentration gradients is the qualtiy of organic material (bacterial films), but particle size and flow rate are important, too. Investigations concerning the behavior of PAHs in surface and sewage water in some cases showed strong correlations to other parameters. Analysis of PAHs was performed by high-pressure liquid chromatography and thin-layer chromatography.

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REFER ALSO TO CITATION(S) 26908, 26910, 26911, 26912, 26913, 26914, 27650, 27746, 27776, 27828

27687 (SAND—80-2577/Vol.2, pp 163-258) **Seawater-sediment interaction at elevated temperatures and pressures: implications for the near field chemical environment.** Seyfried, W.E. Jr., Thornton, E.C.; Janecky, D.R. Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 1 of 2.

Results of four experiments are reported which document chemical exchange and mineralogic modification during seawater-sediment interaction at 200° to 300°C, 500 bars. Sediments used for this study are from MPG-1 (central North Pacific). Experimental conditions (T, P, W/R) were chosen to be reasonably analogous to conditions which will characterize the near field environment; that is a zone within approximately 1 m of the buried waste canister. In general, the major element chemistry of seawater was similarly modified in all experiments. The aqueous concentrations of Ca, Mg, Sr, and SO_4 decreased and SiO_2/sub (aq)/, Na, K, and ΣCO_2 increased relative to values in seawater prior to reaction with sediments. pH decreased and remained distinctly acid. Con comitantly significant concentrations of heavy metals entered seawater from the sediments during reaction. Dissolution of Mn-rich phases profoundly affected alteration processes. For example, reaction of MnO_2 components of the smectite-rich sediment (Pacific smectite) with seawater created an unusually oxidizing milieu ($fO_2 = 10^{-7}$ [74]), and resulted in dissolution of significant quantities of Au from the reaction cell. Although illite-quartz-Fe-chlorite (sediment B)-seawater interaction also created a relatively oxidizing environment, this environment was not capable of oxidizing Au. Thus, in this regard (oxidation potential) sediment mineralogy exerts a strong influence. Mineralogic modification of sediment B at 200° and 300°C was minor and characterized by partial dissolution of illite and exchange of Fe for Mg in chlorite. In contrast the smectite-rich sediment, which, prior to reaction with seawater contained a poorly crystalline smectite phase, clinoptilolite, and amorphous material, recrystallized totally to a well defined smectite mineral. Anhydrite was abundantly present amongst the alteration products of all experiments.

27688 (SAND—80-2577/Vol.2, pp 261-270) **Radiolytic oxidation of neptunium in environmental solutions.** Nash, K.; Fried, S.; Friedman, A. (Argonne National Lab., IL). Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 1 of 2.

Neptunium-237 occurs in process waste solutions from nuclear reactors. If these reprocessing wastes are to be disposed of in a deep geological repository the long half-life of the neptunium (T/sub 1/2/ = 2.14 x 10^6 y) requires that it be safely immobilized for a

long time in order to preclude its introduction into the biosphere. It is postulated that the sole agent responsible for the mobilization of radionuclide wastes from a repository will be the ground water acting to leach material from the emplaced source. It has been shown that among other things the rate of migration of radionuclides in groundwaters flowing through aquifers is dependent upon ionic charge, the less highly charged ions move more rapidly (or are bound less tightly to the rock) than the more highly charged ions. Groundwater in this report may be anything from practically pure water to water saturated with sodium chloride and other salts as from a bedded salt repository. Radiation fields such as would exist in the near vicinity of a nuclear waste repository have been shown to affect the oxidation states of oxidizable actinide ions. It has been found that neptunium can be oxidized to NpO_2^+ and NpO_2^{++} by radiolytic effects in various groundwaters. The evaluation of these effects is important in making a safety assessment of a geologic repository.

27689 (SAND—80-2577/Vol.2, pp 271-284) **Radiolytic oxidation and reduction of plutonium.** Fried, S.; Friedman, A.; Sullivan, J.C.; Nash, K.; Cohen, D.; Sjoblom, R. (Argonne National Lab., IL). Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 1 of 2.

It has been shown on several occasions that all other things being equal, the rate of migration of plutonium through an aquifer is greatly influenced by its oxidation state. It is a reasonable expectation that other actinides exhibiting multiple oxidation states will behave similarly. By and large, the more highly charged ions in solution move through rock strata more slowly than those of lesser charge. Thus for comparative experiments on the relative migration rates of Pu(IV) and Am(III) we would expect Pu(III) to move about 10 times faster than Pu(IV) and it has been shown PuO_2^{2+} moves about 250 times more rapidly than Pu(IV). Since one of the more important paramters of safety assessment is radionuclide migration rate it can be seen that it becomes important to know the oxidation states of radionuclides (actinides for the purpose of this report) existing in possible leachates from the material originally emplaced in a repository. It was with this in mind that a study of the intrinsic stability of plutonium oxidation states in ground water solutions was undertaken.

27690 (SAND—80-2577/Vol.2, pp 285-300) **Measurement of penetration depths of plutonium and americium in sediment from the ocean floor.** Fried, S.; Friedman, A.; Hines, J.; Sjoblom, R.; Schmitz, G.; Schreiner, F. (Argonne National Lab., IL). Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January-December 1979. Volume II. Appendices (principal investigator progress reports). Part 1 of 2.

The clay-like sediment covering the ocean floor constitutes the last barrier that shields the biosphere from contamination by radionuclides stemming from the nuclear wastes of a subsea repository. In the event of a failure of the engineered barriers, the mobility of the released radionuclides in the sediment determines the rate and extent of entry into the water of the ocean. In this article, the initial results of measurements designed to determine the mobility of transuranium elements in sediment from the ocean floor are presented. Data indicate very low migration rates and imply strong chemisorptive interaction with the sediment.

27691 (SAND—80-2577/Vol.2, pp 323-348) **Fallout radionuclides in the Pacific Ocean: vertical and horizontal distributions, largely from GEOSECS stations.** Bowen, V.T. (Woods Hole Oceanographic Institution, MA); Noshkin, V.E.; Livingston, H.D.; Volchok, H.L. Apr 1981. NTIS, PC A99/MF A01.

In Subseabed disposal program annual report, January to December 1979. Volume II. Appendices (principal investigator progress reports). Part 1 of 2.

From GEOSECS stations, largely, the 1974 distributions of Pu and of ^{137}Cs are described from 1978 cruises by the authors. The Pacific exhibited, everywhere, a shallow subsurface layer of Pu-rich water with its concentration maximum at about 465 m in 1974; over a large portion of the central North Pacific a second layer of Pu-labelled water, less concentrated than the shallow layer, lay just above the bottom. Similar features were not observed in the case of ^{137}Cs. The inventories of both Pu and ^{137}Cs in the water column at most 1974 stations are substantially greater than those to be expected from world-wide fallout alone; these inventroy excesses appear to be attributable to close-in fallout, but only if the ratio Pu/^{137}Cs in this source was much higher than in world-wide fallout. The North Pacific mean ratio of the inventories is 2.2 times that observed in world-wide fallout. Resolubilization of Pu both from sinking particles and from sediments explains peculiarities of its depth distributions. There is little evidence for tracer movement by sliding downward along density surfaces; ^{137}Cs appears to have moved to depth by downmixing at the edge of the Kuroshio, and then moved horizontally and upward along σ/sub t/ contours. The shallow Pu-rich layer shows no coordination with density, salinity or O_2 isopleths. The deep Pu-rich layer is restricted to a narrow range of O_2 concentrations that confirm its origin in the Aleutian Trench and rapid spread southward and laterally. Near-bottom circulation processes have been much more active than here-to-fore described.

5205 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 27695

27692 **(CONF-8010195—1) Recreational-benefit estimation for lake water-quality improvement: a comparative analysis.** Liu, B.C. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 19p. NTIS, PC A02/MF A01. Order Number DE81023829.

From Annual conference of the American Water Resource Association; Minneapolis, MN, USA (12 Oct 1980).

The primary objective of this study was to develop a model by which the economic values of those presently not marketed services provided by lake water body can be quantitatively assessed and the effectiveness of the public investment projects evaluated. The technical procedures underlining the model are illustrated as follows: first, a utility function relating travel cost and person-trips to the lake is developed in a demand function for lake recreation; secondly, the demand functions and the consumer surplus measures under the functions are exposed; thirdly, the shifts of the demand functions, before and after the project, are assessed so that the net benefit of the project can be represented by the changes in the consumer surplus per person-trip; finally, the incremental changes in the value of total consumer surplus gained or lost, per period of time, are determined and consequently, the cost-effectiveness of the restoration project evaluated accordingly. A site-specific lake demonstration project is used as a case study in this cost-effectiveness evaluation model. The feasibility and empirical difficulties of the model are also illustrated.

27693 **(HEDL-SA—2370-FP) Water availability and use for energy production.** Fletcher, J.F.; Sonnichsen, J.C. Jr.; Savage, W.F. (Hanford Engineering Development Lab., Richland, WA (USA); Department of Energy, Washington, DC (USA)). 1981. Contract AC14-76FF02170. 17p. (CONF-810592—1). NTIS, PC A02/MF A01. Order Number DE81024110.

From 9. annual conference and international trade fair National Water Supply Improvement Association; Washington, DC, USA (31 May 1981).

As part of the planning for siting, design, and operation of energy production facilities, adequate planning for the obtaining of assured adequate water supplies and for their efficient utilization will be essential. As an aid in that planning process, the Water Use Information System (WUIS) has been developed. WUIS is a comprehensive computerized data base containing extensive, localized information on surface and ground water availability and quality in the United States, together with data on water utilization by currently operating US electrical generating plants. An ancillary econometric predictive model designed for use in conjunction with WUIS is capable of providing regional forecasts of future electrical demand, generation, and corresponding water requirements. The basic tenets of the predictive model are adaptable as well to energy production other than generation. A description of the design and operation of WUIS is given.

5206 Regulations

REFER ALSO TO CITATION(S) 26813

53 ENVIRONMENTAL-SOCIAL ASPECTS OF ENERGY TECHNOLOGIES

5301 Social And Economic Studies

REFER ALSO TO CITATION(S) 27666

27694 (CONF-8008115—1) Site location and technology as determinants of socioeconomic impacts: the lessons from synfuels. Wernette, D.R. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 25p. NTIS, PC A02/MF A01. Order Number DE81023054.

From Rural Sociological Society meeting; Ithaca, NY, USA (19 Aug 1980).

The impacts of the construction and operation of a variety of synthetic fuels plants are examined through predominantly rural case studies. The employment demands of the synthetic fuels technologies vary in terms of the numbers and types of workers required. These employment demands are one of the main factors determining the magnitude of socio-economic impacts: the greater the employment, ceteris paribus the greater the impact. The assimilative capacity of the area, measured as the labor and infrastructure reserves available to meet the corresponding demands from new projects, is the other main determinant of the level of socioeconomic impacts of such projects. Since assimilative capacity also varies between geographical units, the site location of the synfuels project also determines the magnitude of socioeconomic impacts: the greater the assimilative capacity, all else held constant, the less the impact. The case studies presented show both types of variation, and allow one to control one variable while studying the effects of the other. The results offer planners the means for reducing negative and increasing positive socioeconomic impacts through influencing the siting patterns and technology of a potential synthetic fuels industry.

27695 (LBL—9626) Water constraints on energy development: a framework for analysis. Harte, J. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Jun 1979. Contract W-7405-ENG-48. 23p. (CONF-790727—2). NTIS, PC A02/MF A01. Order Number DE81025212.

From IIASA-RSI conference on systems aspects of energy and mineral resources; Laxenburg, Austria (9 Jul 1979).

A study of the impacts of future energy development on freshwater resources carried out as part of the US National Academy of Sciences' CONAES study led to the identification of severe constraints on US energy development that could arise in the future because of the geographic and temporal variability of the freshwater resource. The present essay is not intended to summarize the results of the CONAES work on wate-energy problems, but rather to describe the components of the analytical method developed for that study. Five facets characterize our assessment method: specification of future patterns of energy supply and demand takes the form of scenarios; which describe possibilities rather than predictions; the water requirements of future energy activities often are highly unertain today; the freshwater resource is described by a set of quantities calculable from daily runoff measurements; the information encapsulated by these parameters is of direct relevance to aquatic biologists and to energy suppliers and consumers; and only a very preliminary and incomplete effort has gone into the important problem of placing the impacts of water consumption in a human context.

5302 Assessment Of Energy Technologies

REFER ALSO TO CITATION(S) 27319

27696 (P—110-80-004) Macroeconomic implications of energy policy. Final report. Gallo, D.E. (California State Univ., Chico (USA). Dept. of Economics). Dec 1980. 48p. California Energy Commission, Sacramento. Order Number DE81903676.

The macroeconomic consequences of energy price increases are discussed in this report. The following conclusions were drawn: (1) Rising energy prices generate macroeconomic impacts in excess of what would be expected from the small share of energy in aggregate production costs. (2) If capital and labor were freely substitutable for energy inputs, and prices adjusted to reflect relative factor scarcity, higher energy prices would have little negative impact on output, growth, and employment. (3) Empirical work indicates that opportunities for industrial sector energy conservation are limited within the existing stock of capital. (4) The long-run potential for achieving reduced energy use in the industrial sector is significant. If investment in new plant and equipment can be increased to an adequate level, in the long-run the negative economic effect of higher energy costs will be inconsequential. (5) It is questionable as to whether the supply of financial capital can be increased without serious economic and social disruption in the short-run. (6) Incentive systems or regulations designed specifically to promote increased efficiency of industrial energy use have the greatest probability of success in minimizing the negative macroeconomic consequences of higher energy costs. This implies that reallocation of existing capital supplies would be more effective than attempts to increase the aggregate supply of financial capital. (7) Capital intensive energy supply strategies compete in financial markets with investment in new plant and equipment. Their use should be weighed carefully against investment opportunities for improvements in industrial end-use efficiency. (DMC)

27697 Research priorities: Department of Energy. Burr, W.W. Jr.; Edington, C.W. (Dept. of Energy, Washington, DC). pp 753-759 of Health implications of new energy technologies. Rom, W.N.; Archer, V.E. (eds.). Ann Arbor, MI; Ann Arbor Science Publishers, Inc. (1980).

From Health implications of the new energy technologies; Park City, UT, USA (4 Apr 1979).

Within the DOE, an Office of Health and Environmental Research (OHER) manages a comprehensive research program on environmental and health effects associated with energy technology developments. The scope of activities cover a broad spectrum and are outlined in this presentation. (KRM)

5303 Environmental Impact Statements

REFER ALSO TO CITATION(S) 26851

27698 (DOE/EIS—0076) Bonneville Power Administration final environmental impact statement: alumax environmental impact statement. (Department of Energy, Washington, DC (USA)). May 1981. 445p. NTIS, PC A19/MF A01. Order Number DE81025768.

Construction and operation of the proposed Alumax-Pacific Corporation, primary aluminum reduction plant and associated transmission and substation facilities at Umatilla, Oregon, would result in degradation of air quality as related to particulates, sulfur oxides and fluorides. Increased population in adjacent local communities would require significant amounts of new land development, and cause overcrowding in certain school districts. The increased tax base will allow for mitigation of these problems. In conclusion, the Alumax environmental impact statement, while identifying several areas of significant impact of the proposed Umatilla plant, does not determine that any of these impacts would disallow the construction and operation of the plant at the Umatilla site. Alternative plant technologies and methods of operation were examined with the subsequent finding that the proposed plant would be operating at efficient levels of energy consumption and with acceptable levels of environmental impacts.

55 BIOMEDICAL SCIENCES, BASIC STUDIES

5501 Behavioral Biology

REFER ALSO TO CITATION(S) 27651

5502 Biochemistry

REFER ALSO TO CITATION(S) 27623, 27716, 27726, 27758, 27795, 27815, 27816

27699 Morphological model of the surface-layer array in Spirillum serpens. Glaeser, R.M. (Univ. of California, Berkeley); Chiu, W.; Grano, D.; Taylor, K. Contract W-7405-ENG-48. pp 22-26 of Electron microscopy at molecular dimension. Baumeister, W.; Vogell, W. (eds.). Berlin, Germany; Springer-Verlag (1980).

The presence of an extensive, periodic surface-layer structure on the gram-negative bacterium Spirillum serpens VHA was first reported by Murray (1963). Murray and collaborators demonstrated that heating the bacteria at 60°C released the periodic surface layer material from the cell wall, and that this released material could be readily isolated by differential centrifugation. Subsequent work established that the surface layer structure is composed of a single polypeptide, whose apparent molecular weight is ~ 14,000. This protein is attached to the external surface of the outer membrane, called the backing layer by Murray and collaborators. Murray has demonstrated that the crystalline surface-layer protein can be removed by treatment with 1.5M guannidine HCl, and that reconstitution onto the naked outer membrane material is facilitated by calcium ions. The outer membrane itself is composed of lipopolysaccarides and phospholipids and of at least two major polypeptides having apparent molecular weights of ~ 35,000 and ~ 78,000.

27700 Induction of L-phenylalanine ammonia-lyase during utilization of phenylalanine as a carbon or nitrogen source in Rhodotorula glutinis. Marusich, W.C.; Jensen, R.A.; Zamir, L.O. (State Univ. of New York, Binghamton). Contract EP-78-S-02-4967. *Journal of Bacteriology ;* **146**: No. 3, 1013-1019(Jun 1981).

Rhodotorula glutinis is a convenient source of L-phenylalanine ammonia-lyase, an enzyme that is useful as a biochemical reagent in the assay of L-phenylalanine. There have been previous descriptions of induced lyase production in complex medium where induction occurs late in exponential growth, suggesting a role in secondary metabolism such as is the case in higher plants. A higher specific activity of L-phenylalanine ammonia-lyase (sixfold higher than in complex medium) can be obtained during midexponential growth in a defined medium containing L-phenylalanine as the sole source of carbon. L-phenylalanine will also induce lyase synthesis during exponential growth in minimal medium in which L-phenylalanine is the sole source of nitrogen. The appearance of lyase in complex medium supplemented with L-phenylalanine is probably triggered fortuitously by exhaustion late in growth of a prime source of nitrogen. In this study, R. glutinis appeared to express a single lyase enzyme, regardless of whether induction was nitrogen signaled or carbon signaled. Thin-layer chromatographic analysis of ether extracts prepared fom cultures induced with doubly labeled (U-^{14}C; ring-4-^{3}H) L-phenylalanine provided evidence of a catabolic sequence containing cinnamic acid, benzoic acid, and 4-hydroxybenzoic acid as degradative intermediates. 3,4-Dihydroxybenzoic acid was not identified as a catabolic intermediate.

27701 Magnetic circular dichroism: adapting an electromagnet to accommodate a standard cryostat. Sutherland, J.C. (Brookhaven National Lab., Upton, NY). *Analytical Biochemistry ;* **113**: No. 1, 108-111(1 May 1981).

An electromagnet was modified for measurements of the magnetic circular dichroism of samples held at cryogenic temperatures using a standard laboratory cryostat. The external dimensions of the cryostat are too great to permit its insertion in the air gap between the poles of the magnet without an unacceptable reduction in the strength of the magnetic field at the sample. This problem was overcome by designing new pole caps which become an integral part of the vacuum system of the cryostat. The ends of the new pole caps project into the body of the cryostat so that the gap between them is 1 in. or less, thus achieving a magnetic field exceeding one Tesla at the sample. No permanent alterations of the cryostat are required. The chief advantages of this design are economy and flexibility since a general purpose cryostat is used instead of a special unit designed to fit in the small space between the poles of an unmodified magnet. The cryostat used in this design cools the sample by conduction; thus the problem of optical distortions resulting from bubbling of liquid nitrogen or other cryogen is avoided and the temperature can be varied continuously using standard auxiliary equipment. Extra windows at 90° with respect to the optical beam permit inspection of the sample in situ and could be used for experiments such as fluorescence-detected magnetic circular dichroism which require optical access perpendicular to the direction of the magnetic field.

27702 Pathway of plasmid transformation in Pneumococcus: open circular and linear molecules are active. Saunders, C.W.; Guild, W.R. (Duke Univ., Durham, NC). Contract AS05-76EV03941. *Journal of Bacteriology ;* **146**: No. 2, 517-526(May 1981).

We have extended the analysis of plasmid transformation in Streptococcus pneumoniae by finding that monomeric and dimeric open circular and linear forms of pMV158 were active in transformation. Their efficiencies were at least 35-fold lower than those of the corresponding closed circular forms. The evidence came largely from analysis of S1 nuclease-digested plasmid deoxyribonucleic acid by combinations of dye-buoyancy, gel electrophoresis, and sedimentation velocity methods. As with closed circular forms, monomer open circular forms gave second-order kinetics and dimer forms gave first-order kinetics. Unique linear products of digestion by either of two restriction enzymes were inactive, but a mixture of the two digests was active, as was the mixture of linear monomer deoxyribonucleic acids produced by S1 nuclease. Absolute efficiencies of transformation were low even for closed circular donors. All of the results, including the low efficiencies, were consistent with the interpretation that plasmid replicons were assembled in the recipient cell by pairing of fragments of single strands that had entered the cell separately from duplex donors that had been cut on the cell surface.

27703 π cation radicals of ferrous and free base isobacteriochlorins: models for siroheme and sirohydrochlorin. Chang, C.K. (Michigan State Univ., East Lansing); Hanson, L.K.; Richardson, P.F.; Young, R.; Fajer, J. Contract AC02-76CH00016. *Proceedings of the National Academy of Sciences of the United States of America ;* **78**: No. 5, 2652-2656(May 1981).

Theoretical and experimental optical, redox, and paramagnetic results are presented for models of siroheme, the iron isobacteriochlorin prosthetic group of nitrite and sulfite reductases, and of sirohydrochlorin, the metal-free siroheme that is an intermediate in the biosynthetic pathway to vitamin B_{12}. The facile oxidation of many isobacteriochlorins, which distinguishes them from porphyrins and chlorins, suggests that the siroheme macrocycle itself may undergo oxidation in the multi-electron enzymatic cycles that reduce nitrite to ammonia and sulfite to hydrogen sulfide. Extended Hueckel MO calculations (i) help rationalize the redox properties of isobacteriochlorins compared with those of porphyrins and chlorins; (ii) indicate that Fe(II) pyridine carbonyl [(py) (CO)] complexes of isobacteriochlorins, unlike those of porphyrins and chlorins, should undergo oxidation from the macrocycle rather than the metal to yield π cation radicals; (iii) suggest that, in hexacoordinated Fe(II) isobacteriochlorin complexes, the site of oxidation - i.e., the metal or the macrocycle - will depend on the ligand field induced by the axial ligands; and (iv) predict similar unpaired spin density profiles for metal-free and (py)(CO)Fe(II) isobacteriochlorin radicals. Experimental data for three isomeric free-base and (py)(CO)Fe(II) complexes of dimethyloctaethylisobacteriochlorins support the theoretical calculations and establish the existence of Fe(II) isobacteriochlorin π cations in vitro.

27704 Liposomes and chelating agents. Rahman, Y.E. Contract W-31-109-ENG-38. pp 265-298 of Liposomes in biological systems. Gregoriadis, G.; Allison, A.C. (eds.). New York, NY; John Wiley and Sons, Ltd. (1980).

A new approach to the delivery of metal chelators, with the aim of increasing their therapeutic efficacy was described. The sizes of unilamellar liposomes were determined by conventional electron microscopy after negative staining. Rapid measurement of the sizes of multilamellar liposomes was performed by a Coulter transducer equipped with a multichannel analyzer. The stability of liposomes was tested by leakage of chelating agent with time. The concentration of chelating agents encapsulated within liposomes was determined by the binding of a radioactive metal ion to the chelating agent before liposome preparation. Liposomal lipids, given inthe form of KCl-liposomes, showed no immediate or delayed toxicity to mice. A moderate increase of alkaline phosphatase activity of the liver and spleen occurred from 4 hours to 7 days after KCl-liposome injection. Data from mice receiving liposomes containing either EDTA or DTPA was included. The encapsulation of chelating agents in liposomes significantly altered the tissue distribution of these agents and prolonged their retention in the body of mice. Tissues rich in reticuloendothelial cells, where particulate heavy metals accumulate also had the highest uptake of liposomes, parenchymal cells in various organs took up liposomes as well. The high uptake of liposomes in reticuloendothelial tissues and within cells is therapeutically advantageous in removing toxic metals. 13 figures, 5 tables. (DP)

27705 Extraneous additions during sampling for trace element analyses and results of determinations in serum of healthy subjects. Versieck, J.; de Rudder, J.; Hoste, J.; Barbier, F. (Univ. of Ghent, Belgium). pp 315-328 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Controversy flourishes about the concentration of several trace elements in human serum, other body fluids and tissues. Mounting evidence suggests that inadvertent contamination of samples may be the cause of numerous inconsistencies. A method was developed for direct estimation of the resulting artifacts. Current procedures of specimen collection and storage were simulated in vitro with neutron activated instruments. The radioactivity entering the samples in these experimental circumstances reflects the extraneous additions during the procedure. The significance of the findings can easily be assessed by comparing the observed additions to the expected concentrations of the elements in the samples. In several cases, the errors turned out to be extremely important, particularly in needle biopsies of the liver and in samples of blood collected with disposable steel needles, where the extraneous additions of chromium and cobalt may largely exceed the intrinsic concentrations.

27706 Periodic changes in the oxidation state of manganese in photosynthetic oxygen evolution upon illumination with flashes. Wydrzynski, T.; Sauer, K. (Univ. of California, Berkeley). Contract W-7405-ENG-48. *Biochimica et Biophysica Acta ;* **589**: 56-70(1980).

The pattern of manganese released from chloroplast membranes by a rapid temperature shock after various illumination regimes indicates that changes in the oxidation state of bound manganese occur durin photosynthesis. Continuous illumination decreases by 35 to 40% the amount of Mn(II) released in the presence of $K_3Fe(CN)_6$ compared with a dark-adapted control. Following illumination and heat treatment, the addition of the reductant H_2O_2 to the samples causes an increase in the level of electron paramagnetic resonance (EPR)-detectable manganese. The pH dependence of the H_2O_2 reduction indicates that the non-EPR-detectable manganese present in the heated sample after illumination is in the form of higher oxidation state compounds, e.g. MnO_2. The light-induced Mn(II) decrease is reversible in the dark with t/sub 1/2/ ~ 40 s and can be prevented by the presence of the Photosystem II inhibitors 3-(3,4-dichlorophenyl)-1,1-dimethyl urea or fluorocarbonylcyanide phenylhydrazone during the illumination period.

27707 Enzyme changes associated with mitochondrial malic enzyme deficiency in mice. Mohrenweiser, H.W.; Erickson, R.P. (Univ. of Michigan, Ann Arbor). Contract E(11-1)-2829. *Biochimica et Biophysica Acta ;* **587**: 313-323(1979).

A genetically determined absence of mitochondrial malic enzyme (EC 1.1.1.40) in c/sup 3H//c/sup 6H/ mice is accompanied by a four-fold increase in liver glucose-6-phosphate dehydrogenase and a two-fold increase for 6-phosphogluconate dehydrogenase activity. Smaller increases in the activity of serine dehydratase and glutamic oxaloacetic transaminase are observed while the level of glutamic pyruvate transaminase activity is reduced in the liver of deficient mice. Unexpectedly, the level of activity of total malic enzyme in the livers of mitochrondrial malic enzyme-deficient mice is increased approximately 50% compared to littermate controls. No similar increase in solublle malic enzyme activity is observed in heart of kidney tissue of mutant mice and the levels of total malic enzyme in these tissues are in accord with expected levels of activity in mitochondrial malic enzyme-deficient mice. The divergence in levels of enzyme activity between mutant and wild-type mice begins at 19 to 21 days of age. Immunoinactivation experiments with monospecific antisera to the soluble malic enzyme and glucose-6-phosphate dehydrogenase demonstrate that the activity increases represent increases in the amount of enzyme protein. The alterations are not consistent with a single hormonal response.

27708 Use of short-term and quasi-steady influx in estimating plasmalemma and tonoplast influx in barley root cells at various external and internal chloride concentrations. Cram, W.J. (Univ. of California, Los Angeles); Laties, G.G. *Australian Journal of Biological Sciences ;* **24**: 633-646(1971).

Chloride influx measured with ^{36}Cl over a 10 min loading period followed by a 5 min wash in inactive solution is used as an estimate of influx across the plasmalemma in barley roots. Chloride influx measured over a 60 min loading period followed by a 30 min wash is used as an estimate of the quasi-steady influx from the external solution to the vacuole. The 10 min load, 5 min was flux estimate is shown not to be in error due to inclusion of extracellular contents in the root cortex or in the stele. It therefore appears to be a good estimate of the influx across the plasmalemma of the cortical cells. At external chloride concentrations below about 5 mM the plasmalemma influx and the influx to the vacuole are approximately equal, and therefore the influx across the plasmalemma appears to be the rate-limiting step in the influx of chloride to the vacuole. At external chloride concentrations above about 10 mM the plasmalemma influx increases nearly linearly with external chloride concentration to very high values at 80 mM, whereas the influx to the vacuole does not increase above 20 to 30 mM. The saturation in influx to the vacuole at high external chloride concentrations therefore appears to be determined by the saturation of transport across the tonoplast or of a transport process directly through the cytoplasm to the vacuole, in confirmation of the conclusion of Torii and Laties (1966). Some observations suggest that part of the fluxes across the plasmalemma are mediated by exchange diffusion. In salt-loaded tissue the plasmalemma influx and the influx to the vacuole are both reduced. This apparent negative feedback relationship between chloride content and influx of chloride is briefly discussed.

5503 Cytology

REFER ALSO TO CITATION(S) 27708, 27785, 27786, 27793

27709 Bone marrow cytotoxic precursor T cells: alloantigen-induced cytotoxic T-cell responses by murine bone marrow cells in vitro. Klimpel, G.R.; Dorshkind, K.; Klimpel, K.D.; Rosse, C. (Univ. of Washington, Seattle). Contract 79EV10270. *Cellular Immunology ;* **61**: No. 1, 154-164(Jun 1981).

When bone marrow cells, obtained from C57BL/6 mice, were incubated in vitro with irradiated BALB/c spleen cells, cytotoxic activity against P815 tumor cells developed at 5 to 7 days of culture. This cytotoxic activity was T cell mediated and specific for the H-2 type of the allogeneic spleen cells used as stimulators. The generation of this cytotoxic T-cell activity was dependent on T

cells present in the bone marrow since T-cell-depleted bone marrow cells failed to generate a cytotoxic response in vitro. Further, bone marrow cells incubated in culture medium not supplemented with 2-mercaptoethanol (2-ME) failed to generate alloantigen induced cytotoxic responses. Cytotoxic activity generated by bone marrow cells was always lower than the cytotoxic activity generated by alloantigen stimulated spleen cells. The possibility that differentiation of pre-T cells into cytotoxic effector T cells is taking place in this in vitro response is considered.

27710 **Localization of dehydrogenases, reductases, and electron transfer components in the sulfate-reducing bacterium Desulfovibrio gigas.** Odom, J.M.; Peck, H.D. Jr. (Univ. of Georgia, Athens). Contract AS-09-97 ER-10499. *Journal of Bacteriology ;* **147**: No. 1, 161-169(Jul 1981).

Various dehydrogenases, reductases, and electron transfer proteins involved in respiratory sulfate reduction by Desulfovibrio gigas have been localized with respect to the periplasmic space, membrane, and cytoplasm. This species was grown on a lactate-sulfate medium, and the distribution of enzyme activities and concentrations of electron transfer components were determined in intact cells, cell fractions prepared with a French press, and lysozyme spheroplasts. A significant fraction of formate dehydrogenase was demonstrated to be localized in the periplasmic space in addition to hydrogenase and some c-type cytochrome. Cytochrome b, menaquinone, fumarate reductase, and nitrite reductase were largely localized on the cytoplasmic membrane. Fumarate reductase was situated on the inner aspect on the membrane, and the nitrite reductase appeared to be transmembraneous. Adenylylsulfate reductase, bisulfite reductase (desulfoviridin), pyruvate dehydrogenase, and succinate dehydrogenase activities were localized in the cytoplasm. Significant amounts of hydrogenase and c-type cytochromes were also detected in the cytoplasm. Growth of D. gigas on a formate-sulfate medium containing acetate resulted in a 10-fold increase in membrane-bound formate dehydrogenase and a doubling of c-type cytochromes. Growth on fumarate with formate resulted in an additional increase in b-type cytochrome compared with lactate-sulfate-grown cells.

27711 **Modulation of growth, differentiation, and mucous glycoprotein synthesis by retinyl acetate in cloned carcinoma cell lines.** Marchok, A.C.; Clark, J.N.; Klein-Szanto, A. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Journal of the National Cancer Institute ;* **66**: No. 6, 1165-1174(Jun 1981).

The ability of retinyl acetate to alter growth, differentiation, and synthesis of mucous glycoproteins in cell lines cloned from an adenocarcinoma (T-8) and a squamous cell carcinoma (1000 WT) was investigated with the use of F344 rats. Growth rate was inhibited approximately 25 and 50% in 6.6×10^{-6} and 3.3×10^{-5} M retinyl acetate, respectively, in both cell lines. Retinyl acetate induced the formation of numerous vacuoles and periodic acid-silver methenamine-positive granules in both T-8 and 1000 WT cells. After T-8 cells were cultured for 7 days in retinyl acetate, [^{3}H]glucosamine incorporation increased 133- to 147-fold and [^{14}C]serine incorporation increased twelvefold to twentyfold in the high-molecular-weight mucous glycoprotein fraction (peak A) from the cell cytosol. In 1000 WT cells, [^{3}H]glucosamine incorporation increased only 4.2- to 7.5-fold, and [^{14}C]serine incorporation increased only 2.6- to 4.6-fold under the same culture conditions. Thus T-8 cells showed a marked increase in the synthesis and secretion of mucins, whereas 1000 WT cells showed a comparatively small but significant increase.

27712 **Evaluation of photographic emulsions for low-exposure-imaging.** Chiu, W. (Univ. of Arizona, Tucson); Glaeser, R.M. Contract W-7405-ENG-48. pp 194-199 of Electron microscopy at molecular dimension. Baumeister, W.; Vogell, W. (eds.). Berlin, Germany; Springer-Verlag (1980).

The paper examines the contrast transfer characteristics of a variety of photographic emulsions, under conditions of very low electron exposure at the emulsion. Under the conditions used in these experiments, the electron shot noise is a maor limiting factor, but the fog level of the emulsion is also a serious limitation for most of the emulsions. Under very low exposure conditions, 25 μm-thick nuclear track emulsion (NTB3), developed for maximum speed, has been found to be significantly better than all other emulsions tested for 100 keV electrons.

27713 **Use of low temperatures for electron diffraction and imaging of biological macromolecular arrays.** Hayward, S.B. (Univ. of California, San Francisco); Glaeser, R.M. Contract W-7405-ENG-48. pp 226-233 of Electron microscopy at molecular dimension. Baumeister, W.; Vogell, W. (eds.). Berlin, Germany; Springer-Verlag (1980).

Low specimen temperatures have been shown to provide alternative methods for preservation in the electron microscope, and to increase specimen lifetime in the beam. High-resolution electron diffraction patterns of radiation-sensitive specimens are now being recorded with the help of low temperatures, and, with the development of a highresolution cold stage, low-temperature imaging is providing to be a viable method of increasing image resolution. The capability of recording high-resolution images of specimens frozen in ice is now at hand. Clearly low-temperature microscopy of biological macromolecular arrays will see increased popularity in the years to come.

27714 **Electron utilization efficiency in STEM.** Glaeser, R.M. (Univ. of California, Berkeley); Jap, B.K. Contract W-7405-ENG-48. pp 179-185 of Electron microscopy at molecular dimension. Baumeister, W.; Vogell, W. (eds.). Berlin, Germany; Springer-Verlag (1980).

The purpose of this contribution is to point out that the maximum efficiency with which the crystalline, diffracted electrons can be used to produce contrast in the STEM is considerably lower than the collection efficiency for the elastically scattered electrons. Thus, it is not necessarily the case that the high collection efficiency of the annular detector, which is important in the case of isolated heavy atoms, will prove to be a significant advantage of the STEM in the case of crystalline macromolecules. We wish to point out, however, that the calculations which we present here do not represent the total utilization efficiency for producing image contrast of macromolecular structures, since the contribution made by the diffuse scattered electrons is not included in the analysis.

27715 **Use of fluorescence correlation spectroscopy to probe chromatin in the cell nucleus.** Sorscher, S.M.; Bartholomew, J.C.; Klein, M.P. (Univ. of California, Berkeley). Contract W-7405-ENG-48. *Biochimica et Biophysica Acta ;* **610**: 28-46(1980).

All systems in thermodynamic equilibrium are subject to spontaneous fluctuations from equilibrium. For very small systems, the fluctuations can be made apparent, and can be used to study the behavior of the system without introducing any external perturbations. The mean squared amplitude of these fluctuations contains information about the absolute size of the system. The characteristic time of the fluctuation autocorrelation function contains kinetic information. In the experiments reported here, these concepts are applied to the binding equilibrium between ethidium bromide and DNA, a system where the fluorescence properties of the dye greatly enhance the effect of spontaneous fluctuations in the binding equilibrium. Preliminary experiments employ well-characterized DNA preparations, including calf thymus DNA, SV40 DNA, and calf thymus nucleohistone particles. Additional measurements are described which have been made in small regions of individual nuclei, isolated from green monkey kidney cells, observing as few as 5000 dye molecules. The data indicate that the strength of dye binding increases in nuclei isolated from cells which have been stimulated to enter the cell growth cycle. The viscosity of nuclear material is inferred to be between one and two orders of magnitude greater than that of water, and it decreases as the cells leave the resting state and enter the cell growth cycle. Washing the nuclei also lowers the viscosity. These experiments demonstrate that fluorescence correlation spectroscopy can provide information at the subnuclear level that is otherwise unavailable.

5504 Genetics

REFER ALSO TO CITATION(S) 27651, 27728, 27752, 27758

5505 Metabolism

REFER ALSO TO CITATION(S) 27706

27716 **Metabolism of sulfur compounds by whole filaments and heterocysts of Anabaena variabilis.** Giddings, T.H. Jr.; Wolk, C.P.; Shomer-Ilan, A. (Michigan State Univ., East Lansing). Contract AC02-76ERO-1338. *Journal of Bacteriology ;* **146**: No. 3, 1067-1074(Jun 1981).

Filaments of the heterocyst-forming cyanobacterium Anabaena variabilis reduced $^{35}SO_4^{2-}$, incorporating ^{35}S into cysteine, methionine, glutathione, sulfolipid, and several unidentified metabolites. The majority of the incorporated label accumulated in reduced glutathione. Heterocysts isolated from labeled filaments contained the same major labeled products. Isolated, metabolically active heterocysts were unable to reduce $^{35}SO_4^{2-}$, but were able to incorporate $^{35}S^{2-}$ into cysteine and glutathione. The results suggest that the initial activation of SO_4^{2-} occurs in vegetative cells and that some reduced forms, possibly including S^{2-}, are translocated into heterocysts.

27717 **Stable isotope variations in human feces in relation to mineral bioavailability studies.** Janghorbani, M.; Ting, B.T.G.; Christensen, M.J.; Young, V.R. (Massachusetts Inst. of Tech., Cambridge). pp 110-115 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Due to human use limitations of radiotracers, methods based on stable isotopes are being developed for application in mineral bioavailability investigations of human subjects. The method of fecal monitoring is of special interest in this regard due to its potentially broad applicability to quantitative aspects of mineral bioavailability. In this communication, we discuss those experimental aspects of this method which influence the accuracy of the determination of the unabsorbed portion of administered isotope. Data are given with respect to preparation of representative subsamples from a fecal homogenate and are discussed in relation to the achievable precision of isotope measurements with neutron activation analysis.

27718 **Manganese in plants as influenced by manganese and iron chelates.** Wallace, A.; Alexander, G.V. (Univ. of California, Riverside). *Communications in Soil Science and Plant Analysis ;* **4**: No. 1, 51-56(1973).

Ferric ethylenediamine di (o-hydroxyphenylacetic acid (FeEDDHA) when used on calcareous soil can induce low Mn levels in plants. The effect can be overcome by Mn or ethylenediamine tetraacetate (EDTA) applications and seems to be related to interference iwth Mn absorption by FeEDDHA at pH levels over 7. Low levels of FeEDDHA effectively overcome Fe deficiency in calcareous soils without causing decreases in the Mn levels in plants. The implications are that two procedures for avoiding Mn deficiency are adding Mn with FeEDDHA treatments and/or using relatively low levels of FeEDDHA for treatment of plants with Fe deficiency.

5506 Medicine

REFER ALSO TO CITATION(S) 27717, 27745, 27745, 27798

27719 **(BNL—29673) Measurement of total body calcium in osteoporotic patients treated with salmon calcitonin.** Zanzi, I.; Thompson, K.; Cohn, S.H. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 12p. (CONF-8105102—1). NTIS, PC A02/MF A01. Order Number DE81024369.

From International symposium on osteoporosis; Jerusalem, Israel (31 May 1981).

In the past, the evaluation of therapies for osteoporosis has been limited by the lack of a suitable quantitative end point. The introduction of the technique of in vivo total body neutron activation analysis (TBNAA) has made possible the precise and accurate measurement of total body calcium (TBCa). Since almost 99 percent of TBCa is in the skeleton, TBNAA gives a direct measurement of skeletal mass. Thus, changes in skeletal mass serve as an objective criterion in the evaluation of the efficacy of the therapy in osteoporosis. Studies performed at Brookhaven National Laboratory and elsewhere have reported the use of calcitonin (CT) in the treatment of primary osteoporosis and related conditions in a limited number of patients. The physiological effects of CT as an inhibitor of bone resorption has been the rationale of its use. The results of a randomized, controlled, 2 year therapeutical trial of CT in a group of postmenopausal osteoporotic women are presented in this report.

27720 (CONF-800392—(Vol.1), pp 259-282) **Benefits of ionizing radiation.** Friedell, H.L.; Bellon, E.M. (Case Western Reserve Univ., Cleveland, OH). Mar 1980. NTIS, PC A19/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

The advantages conferred upon man by the utilization of ionizing radiation are incontrovertible. Since their discovery in 1895, this impact has been enormous and in many instances revolutionary. Major applications of radiation and processes involving radioelements are outlined to include: medical radiation; physical chemical studies; nondestructive testing; sterilization of foods; and substained nuclear fission. Two of these categories are reviewed in detail. The first is the use of ionizing radiation for diagnostic purposes. The second is nuclear energy and its associated radiation.

27721 (CONF-800392—(Vol.1), pp 283-295) **Discussion of a proposed federal radiation research agenda.** Wolfe, S.M. (National Inst. of Health, Bethesda, MD). Mar 1980. NTIS, PC A19/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

The greatest concern should not be what we do not know about the biological effects of radiation or even the important undone epidemiology. Rather, it must be directed at an analysis of the barriers which have prevented both adequate government standards over exposure to ionizing radiation and even a semblance of informed consent on the part of the victims. As I have previously suggested for chemical carcinogens, NIH needs to conduct research to identify potential victims of present and past exposure to ionizing radiation, with priority given to those with the greatest exposures. Any end point which demonstrates biological damage to animals or humans from ionizing radiation should, upon translation into understandable English, be forwarded to the public. In addition, information on the amount of radiation that workers, residents or patients are getting needs to be forwarded to these potential victims rather than being covered up as in the examples of mammography and inaccurately low company records of uranium miner radiation exposure. It is time for the Surgeon General of the United States to start issuing frequent reports on the Adverse Consequences of Ionizing Radiation not unlike the reports on smoking.

27722 (CONF-800392—(Vol.2), pp 1-58) **Science projection paper overview report.** Lasser, E. Mar 1980. NTIS, PC A22/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

This paper is comprised of a large number of position papers that describe current research and potential areas for future research in the field of diagnostic procedures. There are few specific recommendations that can be made for research to identify biological effects below one rod in populations exposed to diagnostic radiological imaging. It is the conclusion of the author that if radiology is practiced according to the state-of-the-art, then it has been responsive to the implications of biological effects whether the effects adhere to the linear hypothesis or vary from it.

27723 (CONF-800392—(Vol.2), pp 91-115) **Radiotherapy.** Pistenma, D.A. Mar 1980. NTIS, PC A22/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

The need for radiotherapy research is exemplified by the 100,000 cancer patients who will fail treatment locally and/or regionally annually for the next several years but who would benefit from better local treatment modalities. Theoretically, all of the areas of investigation discussed in this projection paper have the potential to significantly improve local-regional treatment of cancer by radiotherapy alone or in combination with other modalities. In many of the areas of investigation discussed in this paper encouraging results have been obtained in cellular and animal tumor studies and in limited studies in humans as well. In the not too distant future the number of patients who would benefit from better local control may increase by tens of thousands if developments in chemotherapy and/or immunotherapy provide a means to eradicate disseminated microscopic foci of cancer. Thus the efforts to improve local-regional control take on even greater significance.

27724 **(DOE/EV/04625—T1) Evaluation of energy spectral information in nuclear imaging and investigation of protein binding of cationic radionuclides by lactoferrin. Comprehensive progress report, October 1, 1977-September 30, 1980.** Hoffer, P.B. (Yale Univ., New Haven, CT (USA). School of Medicine). 10 Jun 1980. Contract AS02-78EV04625. 35p. NTIS, PC A03/MF A01. Order Number DE81025541.

Construction of an Anger camera-computer system which allows collection of both the position and energy signals from events detected by the scintillation camera has been completed. The system allows correction of energy response non-uniformity of the detector and facilitates research related to effects of energy discrimination in radionuclide scintigraphy. The system consists of electronic hardware to transmit and digitize the energy signal, software to record and process that signal in conjunction with spatial positioning signals, and additional hardware for recording the processed images so that they can be evaluated by observers. Preliminary results indicate that the system is useful in evaluating clinical images. Assymetric (eccentric) energy windows do improve image quality and are of value in improving detection of lesions on liver scintigraphs. The mechanisms by which Ga-67 is taken up in infection and tumor has been elucidated, and the uptake of radiogallium in microorganisms as a function of its interaction with siderophores was also studied. The primary function of these low molecular weight compounds is to trap ferric ion. However, gallium may be substituted for ferric ion and becomes trapped within the microorganism. The uptake of radiogallium by neutrophils and the role that lactoferrin plays in both intracellular localization of radiogallium and subsequent deposition of the radionuclide at sites of infection were also studied. Investigation of ferric ion analogs reveals definate differences in the affinity of these metals for binding molecules which helps explain their biologic activity. While ferric ion has the strongest affinity for such molecules, gallium has very high affinity for siderophores, moderate affinity for lactoferrin, and lower affinity for transferrin. The relative affinity of indium for these molecules is in approximately the reverse order.

27725 **Plasma concentrations of zinc, copper, manganese and magnesium in acute myocardial infarction.** Zumkley, H.; Bertram, H.P.; Vetter, H.; Tank, B.; Wirth, W. (Univ., Muenster, Germany). pp 211-216 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Plasma zinc, copper, manganese and magnesium concentrations were measured in 31 patients suffering from acute myocardial infarction (AMI). Plasma Zn concentrations were strikingly decreased and plasma Cu slightly increased. Plasma Mg levels were also decreased. No alterations in plasma Mn concentrations were found. A close correlation between fall in plasma Zn concentrations and the rise of serum CPK in patients with AMI could be observed. No correlations were found between infarct localization and sex and alterations in Zn concentrations. In contrast, a close correlation occurred between fall in Zn content and severity of infarction. Thus, the observed alterations in Zn concentrations probably can be used as a diagnositc and prognostic indicator. Furthermore it should be considered whether Zn medication would be of therapeutic benefit in patients suffering from AMI.

27726 **Analysis of iodine in bio-fluids from CAPD patients in an experimental iodine maintenance program.** Rumsey, N.K. (Stephens Coll., Columbia, MO); Anderson, H.D.; Morris, J.S. pp 341-352 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Radiochemical neutron activation analysis (RNAA), using the University of Missouri's Research Reactor (MURR), was employed to determine the iodine concentrations in blood sera and dialysate samples from patients taking part in a continuous ambulatory peritoneal dialysis (CAPD) program which incorporated a daily 2% iodine tincture maintenance subroutine. The molecular iodine was used in CAPD as a possible antiseptic to prevent frequently recurring peritonitis. The purpose of this work was to determine to what extent the iodine was absorbed by the bloodstream. Iodine concentrations in a pooled human sera, synthesized by mixing 231 samples taken from normal women 45 years of age and older, averaged 0.073 +- .007 μg/ml. This compares well with other reports giving an I range of 0.045-0.100 μg/ml. The range of blood sera I concentrations in CAPD patients prior to iodine maintenance was 0.105 to 0.169 μg/ml and the range following a 24-hr CAPD cycle, including iodine maintenance, was 0.134 to 0.230 μg/ml. Post I saline flushes ranged between 0.4 and 3.6 μg/ml. Dialysate samples varied from 0.03 to 1.5 μg/ml over the 24-hr period. Dialysate blanks averaged less than 0.02 μg/ml. Details pertaining to the method of analysis and results are presented.

5507 Microbiology

REFER ALSO TO CITATION(S) 26971, 27655, 27676, 27699, 27700, 27702, 27716, 27758, 27809

27727 **(CONF-810588—1) Microbial accumulation of uranium, radium, and cesium.** Strandberg, G.W.; Shumate, S.E. II; Parrott, J.R. Jr.; North, S.E. (Oak Ridge National Lab., TN (USA)). May 1981. Contract W-7405-ENG-26. 13p. NTIS, PC A02/MF A01. Order Number DE81024970.

From DOE/NBS workshop on environmental speciation and monitoring needs; Gaithersburg, MD, USA (18 May 1981).

Diverse microbial species varied considerably in their ability to accumulate uranium, cesium, and radium. Mechanistic differences in uranium uptake by Saccharomyces cerevisiae and Pseudomonas aeruginosa were indicated. S. serevisiae exhibited a slow (hours) surface accumulation of uranium which was subject to environmental factors, while P. aeruginosa accumulated uranium rapidly (minutes) as dense intracellular deposits and did not appear to be affected by environmental parameters. Metabolism was not required for uranium uptake by either organism. Cesium and radium were concentrated to a considerably lesser extent than uranium by the several species tested.

27728 **Spontaneous mutants of the adenovirus-simian virus 40 hybrid, $Ad2^+ND3$, that grow efficiently in monkey cells.** Anderson, C.W. (Brookhaven National Lab., Upton, NY). *Virology ;* **111**: No. 1, 263-269(May 1981).

An attempt was made to isolate spontaneous mutants of adenovirus type 2 and of the adenovirus-SV40 hybrids, $Ad2^+ND3$ and $Ad2^+ND5$, that would grow efficiently on monkey cells. Virus stocks were serially passaged through the semipermissive established monkey line CV-1. After five serial passages in the absence of intentional mutagenesis, only stocks of $Ad2^+ND3$ yielded significant numbers of variants that plaqued with similar efficiency on human and on monkey cell monolayers. Four independent $Ad2^+ND3$ variants, designated hr600, hr601, hr602, and hr603, have been isolated and partially characterized. No difference was found between the genomes of these variants and the genome of parental $Ad2^+ND3$ by restriction enzyme analysis or by the analysis of heteroduplexes between $Ad2^+ND3$ (or variant) DNA and DNA of the hybrid $Ad2^+ND1$.

5508 Morphology

REFER ALSO TO CITATION(S) 27699

5510 Physiological Systems

REFER ALSO TO CITATION(S) 27709, 27791, 27792, 27796, 27797, 27798, 27816, 27819

27729 **(CONF-810725—1) Age at which the long-cycling spermatogonial stem-cell population is established in the mouse.** Oakberg, E.F. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 5p. NTIS, PC A05/MF A01. Order Number DE81025176.

From 5. workshop on the development and function of the reproduction organs; Copenhagen, Denmark (6 Jul 1981).

The long-cycling A_s spermatogonia are the cells of primary importance in estimating the reproductive and genetic hazards of radiation, chemicals, and pollutants in mammals. This addresses the following questions: (1) when do the long-cycling cells appear; (2) are they present at birth; and (3) from which cells do they arise. (ACR)

5520 Public Health

REFER ALSO TO CITATION(S) 27643, 27654, 27656, 27663, 27705, 27725, 27741, 27742, 27743, 27770, 27771, 27772, 27773, 27774, 27775, 27776, 27777, 27778, 27779, 27780, 27781, 27782, 27784, 27787, 27790, 27794, 27799, 27800, 27801, 27803, 27804, 27805, 27806, 27807, 27810, 27811, 27812

27730 **Trace substances in environmental health. XIV.** Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980). 570p. (CONF-800643—).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Research has shown that there is a continuing need to pursue biological, economical, and health significance of trace substances within the environment. The aim of current programs is directed toward population studies, geochemistry and health, health effects, analytical methodology, and environmental pollution studies of trace elements. One paper was previously entered in the data base. (DLS)

27731 **New titration method for determining the alkalinity in food ash and a study on health effects of alkalinity in food and drinking water.** Kobayashi, J.; Morii, F. (Okayama Univ., Kurashiki, Japan). pp 265-279 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

A new titration method was studied for determining two types of alkalinity in food minerals - one due to the balance between the base-forming elements Ca and Mg and the acid-forming element P, the other to that between K and Na, and S and Cl. The results on most foods and diets investigated reveal that the values of the former type are seriously negative or acid due to the excessive content of P, and that the harder the drinking water the more effective it is in neutralizing the acidity of the total diet by adjusting the Ca:P ratio in foods. This must be the real cause of the inverse correlation between the hardness of drinking water and mortality from cardiovascular diseases. Therefore, the daily intake of a few grams of $CaCO_3$ in powder form to compensate for the acidity of the diet would tend to prevent arteriosclerosis in those who live in soft water areas or who like acid foods such as cereals, meat and fish.

27732 **National Environmental Specimen Bank pilot program.** Harrison,S.A. (National Bureau of Standards, Washington, DC); Gills, T.E.; Maienthal, E.J.; Rook, H.L.; Wise, S.A.; Zeisler, R.L.; Goldstein, G.M. pp 329-340 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

In response to the increasing concern for the potential dangers to human health and the environment by the influx of man-made substances in our ecosystem, the US EPA, in cooperation with the National Bureau of Standards (NBS), is currently studying the feasibility of establishing a National Environmental Specimen Bank. Recently, a 5 year pilot program was initiated at NBS to provide experience in all phases of specimen banking. These activities have been implemented for the first sample included in this pilot study: human liver samples. This paper will describe the sampling protocol, homogenization procedure, storage evaluation and analytical techniques employed for these liver samples.

5530 Agriculture And Food Technology

REFER ALSO TO CITATION(S) 27656, 27807, 27821

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

5601 Radiation Effects

REFER ALSO TO CITATION(S) 27517, 27721, 27723, 27724, 27724

27733 (CONF-800392—(Vol.1), pp 9-28) **What knowledge is considered certain regarding human somatic effects of ionizing radiation.** Beebe, G.W. (National Cancer Inst., Bethesda, MD). Mar 1980. NTIS, PC A19/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

Types of late somatic effects of ionizing radiation discussed here include lens opacification and cataract formation, infertility, birth defects, deficiencies in growth and development, somatic cell chromosomal aberrations, and malignant neoplasms. As is clear, a great deal is known about the effect of ionizing radiation on human health and yet the fundamental understanding of mechanisms is lacking. Epidemiologic studies alone will not provide the answers to many questions because such studies are observational, not experimental, in nature.

27734 (CONF-800392—(Vol.1), pp 30-66) **Radiation exposure and human species survival.** Bertell, R. (Ministry of Concern for Public Health, Buffalo, NY). Mar 1980. NTIS, PC A19/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

Information available from scientific sources without vested interests in the use of radiation is examined in the hope of elucidating the probable long-term effects on the human species of widespread radionuclide contamination. Distinguishing between problems of nuclear war, catastrophic accident in a nuclear industry, waste disposal, terrorist action, periodic accident situations and routine so-called normal pollution seems fruitless as these differ only in degree of pollution per time period. If there is indeed a species death process involved, the rate of deterioration will depend on the rate of pollution, but the result will be the same.

27735 (CONF-800392—(Vol.1), pp 81-110) **Brief review of our present understanding of spontaneous and radiation-induced mutation in humans.** Neel, J.V. (Univ. of Michigan Medical School, Ann Arbor). Mar 1980. NTIS, PC A19/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

The demonstration that radiation can increase the rate of occurence of germ-line mutation in plants and animals is now more than 50 years old. This fact began to attract much wider attention in the 1950's, with the continued testing of nuclear weapons and the advent of nuclear power. In the 1960's, further atmospheric contamination from the testing of nuclear weapons was generally eliminated, and improved radiologic techniques decreased medical exposures, but new genetic concerns were aroused by questions of nuclear reactor safety and problems of radioactive waste disposal. It will be the purpose of this presentation to attempt to put the genetic concerns created by these developments in brief perspective. We

will consider first the nature of spontaneous mutation, then the contribution of spontaneous mutation to disease, then the state of our information concerning radiation-induced genetic damage in higher organisms, including man, and finally, how, as a result of recent technological developments, we may be able to improve our appreciation of the extent to which current and potential radiation exposures might be expected to influence human mutation rates. The difficulties in any precise extrapolation from experimental organisms to man will be brought out.

27736 (CONF-800392—(Vol.1), pp 111-136) **Extrapolation from experimental systems to man. A review of the problems and the possibilities.** Fry, R.J.M. (Oak Ridge National Lab., TN). Mar 1980. NTIS, PC A19/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

Various species of experimental animals, but in particular the mouse, have proved to be good model systems for predicting qualitatively the human response to irradiation. While extrapolations of genetic risks from mice to humans have a long history and a record of considerable success, there have been few attempts to extrapolate quantitatively the findings for somatic effects. An ability to extrapolate risks from exposures to various carcinogenic agents from experimental animal systems and from in vitro systems is an urgent need, and radiation studies provide the model for the development of suitable methods of extrapolation. Accurate measurement of dose, a remarkable store of knowledge about radiobiological responses at the molecular, cellular, and whole-organism level, and the body of data on radiation effects in both man and experimental animals make radiation studies the sensible choice of a model for the development of methods of extrapolation. The principles derived from such studies will make the much more difficult task of extrapolating risks from exposures to chemical carcinogens an easier one.

27737 (CONF-800392—(Vol.1), pp 137-158) **What is our current knowledge about the effects of differences in schedules of delivery of a given dose of ionizing radiation.** Hall, R.J. (Columbia Univ., New York, NY). Mar 1980. NTIS, PC A19/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

In this presentation, the biological effects of ionizing radiation are divided into 3 categories: cell killing, mutagenesis, and carcinogenesis. Each is discussed in detail with respect to radiation quality, radiation dose distribution and the difficulties associated with estimating risk for each.

27738 (CONF-800392—(Vol.1), pp 171-186) **Combined effects, ionizing radiation plus other agents.** Elkind, M.M. (Argonne National Lab., IL). Mar 1980. NTIS, PC A19/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

It is clear from cell studies, and confirmed in a general way by animal sudies, that radiation produces effects that are interactive with those due to other physical agents, chemicals of various types, and viruses. Our understanding is limited, however, in respect to the mechanisms of action in cells and, accordingly, even less penetrating in respect to our comprehension of effects in animals. Thus, the conclusion follows at this time, that we are unable to predict responses in humans due to combined action because of our incomplete understanding of individual and combined responses of radiation and other agents in experimental systems. The study of possible public health hazards due to the combined effects of radiation plus other agents is one that should be coverged upon simultaneously by the laboratory investigator and the epidemiologist-public health specialist. What is clear is the likelihood that agents biologically active in their own right may interact. Indeed, an important and significant guiding principle can be extracted from current knowledge. Relative to induced cellular changes, agents that register lesions in the genetic substance of a cell are likely to produce interactive effects. Such effects may become expressed in individual cells, in tissues, or in whole organisms.

27739 (CONF-800392—(Vol.1), pp 191-210) **Some biological variables in mammalian radiation sensitivity.** Patt, H.M. (Univ. of California, San Francisco). Mar 1980. NTIS, PC A19/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

There is an enormous range of sensitivity in the radiobiological domain, and even for a given biological object or process, expression of the purely random events of radiant energy absorption is subject to a number of variables. Knowledge of factors that influence radiation sensitivity is important for at least two reasons: 1) it provides a framework for understanding how radiation effects are brought about and 2) it helps to uncover unifying principles across diverse systems and species, providing a basis for relative risk assessment of subsets of human populations. This paper provides an overview of some of the biological variables in mammalian radiation sensitivity, with particular attention to the contribution of age, sex, and genetic variations.

27740 (CONF-800392—(Vol.1), pp 233-249) **Opportunities and limits in applying epidemiologic methods to determine the effects of ionizing radiation in humans.** Lilicnfeld, A.M. (Johns Hopkins Univ., Baltimore, MD). Mar 1980. NTIS, PC A19/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

In this presentation, an attempt has been made to indicate rather broadly some of the opportunities and limits of the epidemiologic studies of ionizing radiation effects. The review has not been exhaustive. However, it is clear that much further information is needed before estimates of radiation effects can be made with the kind of confidence that one desires. These scientific considerations should be divorced from the policy considerations where a more conservative attitude would appear desirable. Epidemiologic studies now in progress should be continued on the survivors in Hiroshima and Nagasaki. An attempt should be made to locate other exposed groups in order to obtain information to determine the types and frequencies of malignancies and other possible effects. In epidemiologic studies of the effect of radiation, there should be incorporated mechanisms for obtaining information on other possible carcinogenic factors to detemine the possible effects of interaction between radiation and these other factors. Conversely, in studies of other types of carcinogenic agents, data on radiation exposure should also be obtained. To increase the value of such studies, it is important to develop a standardized method of obtaining information on radiation exposure as well as some means of categorizing such exposure.

27741 (CONF-800392—(Vol.1), pp 297-326) **Informing the public about the risks from ionizing radiation.** Slovic, P.; Fischhoff, B.; Lichtenstein, S. (Decision Research, Eugene, OR). Mar 1980. NTIS, PC A19/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

The recommendation that programs be developed to inform patients, workers, and the general public is an admirable one, which we endorse fully. However, it is important to recognize the difficulties inherent in attempting to communicate highly technical information to people. Although a national survey would be a good first step towards evaluating the knowledge base of workers and the general public, it needs to be buttressed with a more extensive program of empirical research on the problems of communicating information about radiation hazards. Since fundamental psychological processes are involved, one would not have to design each informational statement from scratch; rather, one could convene panels of technical experts, communication experts and representatives of the target population to develop the presentations needed for explaining specific hazards.

27742 (CONF-800392—(Vol.1), pp 327-333) **Public understanding of radiation: what's the problem.** Johnson, R.H. Jr. (Environmental Protection Agency, Washington, DC). Mar 1980. NTIS, PC A19/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

Health physicists and others in the radiological sciences are becoming increasingly frustrated with the apparent lack of public

understanding of radiation risks. The author emphasizes that the problem is not simply a matter of public understanding. Public concerns will not necessarily be alleviated by understanding radiation. This paper examines the typical health physics approach and identifies what is missing in order to clarify the real problem and provide future direction for radiation health professions.

27743 (CONF-800392—(Vol.1), pp 343-368) **Legal, ethical,and economic constraints.** Libassi, F.P.; Donaldson, L.F. Mar 1980. NTIS, PC A19/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

This paper considers the legal, ethical, and economic constraints to developing a comprehensive knowledge of the biological effects of ionizing radiation. These constraints are not fixed and immutable; rather they are determined by the political process. Political issues cannot be evaded. The basic objective of developing a comprehensive knowledge about the biological effects of ionizing radiation exists as an objective not only because we wish to add to the store of human knowledge but also because we have important use for that knowledge. It will assist our decision-makers to make choices that affect us all. These choices require both hard factual information and application of political judgment. Research supplies some of the hard factual information and should be as free as possible from political influence in its execution. At the same time, the political choices that must be made influence the direction and nature of the research program as a whole. Similarly, the legal, ethical, and economic factors that constrain our ability to expand knowledge through research reflect a judgment by political agents that values other than expansion of knowledge should be recognized and given effect.

27744 (CONF-800392—(Vol.1), pp 376-386) **Interagency task force reports on low-level ionizing radiation.** Alvarez, R.; Swick, C. (Environmental Policy Inst., Washington, DC). Mar 1980. NTIS, PC A19/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

This paper contains comments made by the Environmental Policy Institute on the Interagency Task Force Reports on Ionizing Radiation which address the questions published in the Federal Register (12-18-79) concerning NIH's efforts to evaluate ionizing radiation health effects research under PL 95-622. It critically evaluates the reports of the Science Work Group, the Radiation Exposure Reduction Work Group and the Public Information Work Group.

27745 (CONF-800392—(Vol.2), pp 59-90) **Scientific projection paper for cluster B: technology development.** Sinclair, W.K. Mar 1980. NTIS, PC A22/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

This section deals with new technology developments in fields primarily concerned with dose reduction and matters relating to radiation protection rather than toward technology developments that might enhance the beneficial uses of ionizing radiation, except for the consideration of diagnostic techniques which may result in alternatives to ionizing radiation. Three major areas have been identified in which progress can be made via technology development: diagnostic radiology, occupational exposure and exposure of the public to radioactivity.

27746 (CONF-800392—(Vol.2), pp 117-144) **Pathways to man.** Harley, J.H. Mar 1980. NTIS, PC A22/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

The study of radionuclide pathways leading to man generally has the goal of allowing us to predict human exposure from measurements of the radionuclide concentration in some segment of the environment. This modelling process provides a valuable tool in both the regulatory and health protection fields. However, most of the models in the regulatory field and in the health physics profession were designed to maximize exposure estimates. It is preferable to have scientifically defensible estimates and to add suitable safety factors at the end. Thus we are still faced with the development and validation of suitable models for many of the radionuclides of interest. The most useful models will include means of assessing variability and uncertainty. In this case variability might be considered as the differences in behavior due to age, sex or other factors in animals or man and those differences among plant species or animal species that determine their uptake factors. The uncertainty, on the other hand, would be the estimate of possible error in the experimental measurements. Model parameters would always have some variability even for site-specific cases and broad averages for population groups would have to include a factor expressing the possible variabilty and uncertainity. Thus any exposure calculation would have to be expressed with some range and valid assessments of this range are required.

27747 (CONF-800392—(Vol.2), pp 175-211) **Scientific projection paper for physics.** Inokuti, M. Mar 1980. NTIS, PC A22/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

Thorough elucidation of the biological effects of ionizing radiation requires full participation of physical scientists, together with life scientists. Therefore, a key point in the federal research strategy will be to ensure involvement of all physicists actively engaged in radiation research and to recruit more physicists for work in this area. Many new developments in physics, both basic and applied, will occur in dosimetry, spectroscopy, and other physical techniques for studying radiations and their interactions with matter in general. Experiments in radiation biology will be made more precise and accurate in the near future, provided that the outcome of contemporary physical research is to be fully used. Likewise, physics research will continue to provide new kinds of radiation sources and other instrumentation, indispensable for progress in life sciences and their applications. Finally, and most importantly, physical research has provided, and will continue to provide, the soundest possible basis for elucidating detailed mechanisms of molecular and cellular processes that lead to the biological effects of radiation. Even from this point alone, it is amply clear that basic research in radiation physics should be a key element of the federal research strategy.

27748 (CONF-800392—(Vol.2), pp 233-255) **Molecular effects: interactions with chemicals and viruses.** Hanawalt, P.C. Mar 1980. NTIS, PC A22/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

Research focused upon an understanding of the cellular responses to the molecular effects of ionizing radiation should be an essential program component in the Federal Strategy for Research into the Biological Effects of Ionizing Radiation. Although we know that DNA is a principal target molecule for some highly significant biological effects of ionizing radiation, we need to learn which other target substances such as membrane components may also be important. Most of the emphasis should continue to be on DNA effects and highest priority should be assigned to the identification of the complete spectrum of products produced in DNA. Once the lesions are known we can proceed to determine how these behave as blocks to replication and transcription or as modulators on the fidelity of these crucial processes. Considerable work should be done on the repair of these lesions. High priority should be given to the search for mutants in mammalian cell systems with evident defects in the processing of specific lesions. Viruses should provide important tools for the research in this area, as probes for host cell repair responses and also for the isolation of mutants. Furthermore, it is important to consider the interaction of viruses and ionizing radiation with regard to possible modulating effects on repair processes and tumorigenesis. Finally we must consider the important problem of the modification of repair responses by environmental factors.

27749 (CONF-800392—(Vol.2), pp 257-271) **Scientific projection paper for mutagenesis, transformation and cell killing.** Todd, P. Mar 1980. NTIS, PC A22/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

Our knowledge about mutagenesis, transformation, and cell killing by ionizing radiation consists of large bodies of data, which are potentially useful in terms of application to human risk assessment and to the constructive use of radiation, as in cancer treatment. The three end-points discussed above are united by at least

five significant concepts in radiation research strategy: (1) The inter-relationships among the important end-points, mutation, carcinogenesis, and cell killing. Research on one is meaningful only in the context of information about the other two. (2) The interaction of radiations with other agents in producing these end-points. (3) The mechanisms of action of other environmental mutagenic, carcinogenic, and cytotoxic agents. (4) The use of repair deficient human mutant cells. (5) The study of radiation damage mechanisms. There is no better way to extrapolate laboratory data to the clinical and public worlds than to understand the underlying biological mechanisms that produced the data.

27750 (CONF-800392—(Vol.2), pp 273-290) **Scientific projection paper for somatic effects I - cancer.** Burns, F.J. Mar 1980. NTIS, PC A22/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

Radiation-induced cancer is a research problem that bridges a wide spectrum of biophysical and biomedical scientific fields. The precise specification and integration of all of the events and interactions following the absorption of ionizing radiation by target tissues is not yet understood and is the subject of current and planned research. Most research on radiation carcinogenesis can be roughly categorized as being quantitative and/or qualitative in nature. Quantitative radiation carcinogenesis research generally assists in developing risk assessment values. Dose-response curves and models are generated, to provide a basis for extrapolation to low doses from high doses and rates, and assist in supporting risk assessment in the regulatory process. An independent research arena addresses the general question of basic mechanisms, interactions, and fundamental events that play a significant role in radiation-caused cancer. From these studies are evolved hypotheses and molecular, cellular, and tissue models. The development of the full field theory that completely explains why absorbed ionizing radiation causing cancer has the obvious promise of new approaches to cancer control and prevention, as well as potential to ameliorate radiation injury. This section attempts to highlight these areas from the molecular level of study to that of whole populations, from the basic mechanistic approach through the quantification of radiation cancer risk.

27751 (CONF-800392—(Vol.2), pp 299-309) **Research into the biological effects of ionizing radiation somatic effects II: non-cancer.** Bond, V.P. Mar 1980. NTIS, PC A22/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

Somatic effects of radiation can be considered in two categories: low and high level effects. In the low level exposure region (defined here arbitrarily as a single dose of the order of 10 rads or less, or higher doses at very low dose rates), the only somatic effects other than cancer known definitely at present to have health significance are those on fertiltiy and on the developing individual from conception to near birth. Knowledge of these effects is inadequate at present, and the bulk of this report will be devoted to discussing the types of additional investigations required. With respect to non-cancer somatic effects of radiation at intermediate to high doses and dose rates, enough is known to describe in general the course of early (over the first days to perhaps six weeks) effects, following different doses of external radiation. In particular, the non-cancer late effects of intermediate to high doses of internal and external radiation need better definition. The distinction between non-cancer and cancer-related somatic effects is blurred, at least at high dose levels.

27752 (CONF-800392—(Vol.2), pp 361-387) **Scientific projection paper for genetics.** Grahn, D. Mar 1980. NTIS, PC A22/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

This Projection Paper is in two parts. The first is a general discussion of current knowledge and the present basis of radiation protection policy, the rather dismal prospects in the foreseeable future of getting realistic estimates of the human impact of radiation-induced mutation, and some general remarks about radiation standards and research strategy. The second part deals with specific research projects that might increase basic knowledge and narrow the gap between what is needed and what is known. We should emphasize at the outset that, of all environmental hazards, radiation is one whose genetic effects are best understood. There is good information on the dose-response curve, on the effects of dose rate and fractionation, and on the differential sensitivity of different ages, sexes and cell stages. This includes a great deal of knowledge of one organism closely related to man, the mouse. This information has been the basis for risk assessment and for safety standards that are widely accepted as solidly based.

27753 (CONF-800392—(Vol.2), pp 389-422) **Scientific projection paper on biologic effects of ionizing radiation.** Matanoski, G. (Johns Hopkins Univ., Baltimore, MD). Mar 1980. NTIS, PC A22/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

There is widespread knowledge about the effects of radiation in human populations but the studies have had some limitations which have left gaps in our knowledge. Most populations have had exposure to high doses with little information on the effect of dose rate. The characteristics of the populations have been restricted by the location of the disaster, the occupational limitations, or the basic risks associated with the under-lying disease for which radiation was given. All doses have been estimated and such values are subject to marked variability particularly when they rely on sources of data such as hospital records. The biological data although extensive have several deficits in information. Which are the sites in which cancer is produced by irradiation and what are the cell types which are produced. The sensitivity of various tissues and organs are not similar and it is important to rank them according to susceptibility. This has been done in the past but the results are not complete for all cell types and organs. The temporal patterns for tumor development, the latent period, the period of expressed excess, the life-time risks need to be defined more precisely for the cancers. Many populations have not been followed long enough to express the complete risk.

27754 (CONF-800392—(Vol.2), pp 433-466) **Scientific projection paper for space radiobiological research.** Vinograd, S.P. Mar 1980. NTIS, PC A22/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

A nationale for the radiobiological research requirements for space is rooted in a national commitment to the exploration of space, mandated in the form of the National Space Act. This research is almost entirely centered on man; more specifically, on the effects of the space radiation environment on man and his protection from them. The research needs discussed in this presentation include the space radiation environment; dosimetry; radiation biology-high LET particles (dose/response); and operational countermeasures.

27755 **(LA-UR—81-1683) Method for the direct measurement in the treatment volume of neutron dose from pion stars.** Dicello, J.F.; Brenner, D.J.; Zink, S.; Berardo, P.A.; Rosen, I.I. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 11p. (CONF-8106118—1). NTIS, PC A02/MF A01. Order Number DE81025383.

From 4. symposium on neutron dosimetry; Neuherberg/Munich, F.R. Germany (Jun 1981).

Negative pions are presently being used in clinical trials for the treatment of cancer. At the end of their range, negative pions form pionic atoms which disintegrate. These disintegrations, called pion stars, result in the production of neutrons and heavy charged particles. Approximately 80 out of 100 MeV of total kinetic energy is carried by the neutrons. Therefore, the energy deposited in the treatment volume can be significantly affected by the neutron dose, particularly in the case of large treatment volumes. In the past, there has been no technique for directly observing the dose produced only by neutrons in the treatment volume. A method has been developed which measures that dose resulting from neutron-induced hydrogen recoils. This method is described and preliminary experimental data are presented. The results are compared with corresponding calculations.

27756 **Photoreactivation.** Sutherland, B.M. (Brookhaven National Lab., Upton, NY). Contract AC02-76CCH00016. *Bioscience ;* **31**: No. 6, 439-444(Jun 1981).

Important principles of photoreactivation and photoreactivating enzymes are reviewed. Photoreactivation is the enzyme-mediated, light-dependent repair of DNA damaged by ultraviolet light. The photoreactivating enzyme and its cellular effect - biological photoreactivation - are found in almost all organisms from bacteria to man, and may be important in protecting human skin against ultraviolet damage.

27757 **A/α-specific effect of the mms3 mutation on ultraviolet mutagenesis in Saccharomyces cerevisiae.** Martin, P.; Prakash, L.; Prakash, S. (Univ. of Rochester, NY). Contract AC02-76EV03490. *Journal of Bacteriology ;* **146**: No. 2, 684-691(May 1981).

A new gene involved in error-prone repair of ultraviolet (uv) damage has been identified in Saccharomyces cerevisiae by the mms3-1 mutation. Uv-induced reversion is reduced in diploids that are homozygous for mms3-1, only if they are also heterozygous (MATa/MATα) at the mating type locus. The mms3-1 mutation has no effect on uv-induced reversion either in haploids or MATa/MATα or MATα/MATα diploids. The mutation confers sensitivity to uv and methyl methane sulfonate in both haploids and diploids. Even though mutation induction by uv is restored to wild-type levels in MATa/MATa mms3-1/mms3-1 or MATα/MATα mms3-1/mms3-1 diploids, such strains still retain sensitivity to the lethal effects of uv. Survival after uv irradiation in mms3-1 rad double mutant combinations indicates that mms3-1 is epistatic to rad6-1 whereas non-epistatic interactions are observed with rad3 and rad52 mutants. When present in the homozygous state in MATa/MATα his1-1/his1-315 heteroallelic diploids, mms3-1 was found to lower uv-induced mitotic recombination.

27758 **Molecular mechanisms of pyrimidine dimer excision in Saccharomyces cerevisiae: incision of ultraviolet-irradiated deoxyribonucleic acid in vivo.** Reynolds, R.J.; Friedberg, E.C. (Stanford Univ., CA). Contract 76EV70032. *Journal of Bacteriology ;* **146**: No. 2, 692-704(May 1981).

A group of genetically related ultraviolet (uv)-sensitive mutants of Saccharomyces cerevisiae has been examined in terms of their survival after exposure to uv radiation, their ability to carry out excision repair or pyrimidine dimers as measured by the loss of sites (pyrimidine dimers) sensitive to a dimer-specific enzyme probe, and in terms of their ability to effect incision of their deoxyribonucleic acid (DNA) during post-uv incubation in vivo (as measured by the detection of single-strand breaks in nuclear DNA). In addition to a haploid RAD^+ strain (S288C), 11 different mutants representing six RAD loci (RAD1, RAD2, RAD3, RAD4, RAD14, and RAD18) were examined. Quantitative analysis of excision repair capacity, as determined by the loss of sites in DNA sensitive to an enzyme preparation from M. luteus which is specific for pyrimidine dimers, revealed a profound defect in this parameter in all but three of the strains examined. The rad14-1 mutant showed reduced but significant residual capacity to remove enzyme-sensitive sites as did the rad2-4 mutant. The latter was the only one of three different rad2 alleles examined which was leaky in this respect. The uv-sensitive strain carrying the mutant allele rad18-1 exhibited normal loss of enzyme-sensitive sites consistent with its assignment to the RAD6 rather than the RAD3 epistatic group. All strains having mutant alleles of the RAD1, RAD2, RAD3, RAD4, and RAD14 loci showed no detectable incubation-dependent strand breaks in nuclear DNA after exposure to uv radiation. These experiments suggest that the RAD1, RAD2, RAD3, RAD4 (and probably RAD14) genes are all required for the incision of uv-irradiated DNA during pyrimidine dimer excision in vivo.

27759 **Mortality of Hanford radiation workers.** Gilbert, E.S. (Battelle Pacific Northwest Lab., Richland, WA). pp 119-127 of Health implications of new energy technologies. Rom, W.N.; Archer, V.E. (eds.). Ann Arbor, MI; Ann Arbor Science Publishers, Inc. (1980).

From Health implications of the new energy technologies; Park City, UT, USA (4 Apr 1979).

Mortality from all causes for white males employed at Hanford for at least two years is 75 percent of that expected on the basis of US vital statistics. Mortality from cancer is 85 percent of that expected. These results are typical of a working population. Neither death from all causes nor death from all cancer types shows a positive correlation with external radiation exposures. Myeloid leukemia, the disease that several studies have found to be associated most strongly with radiation exposure, is not correlated with external radiation exposure of Hanford workers. Two specific cancers, multiple myeloma and to a lesser extent cancer of the pancreas, were found to be positively correlated with radiation exposure. The correlations identified result entirely from a small number of deaths (3 each for multiple myeloma and cancer of the pancreas) with cumulative exposure greater than 15 rem.

5603 Chemicals Metabolism And Toxicity

REFER ALSO TO CITATION(S) 26842, 26853, 26867, 26869, 26873, 26874, 27633, 27681, 27697, 27711, 27718, 27719

27760 **(BNL—29549) Effects of acidic precipitation and acidity on soil microbial processes.** Francis, A.J. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 40p. (CONF-810493—1). NTIS, PC A04/MF A01. Order Number DE81025067.

From AMS/CMOS conference on long-range transport of airborne pollutants; Albany, NY, USA (27 Apr 1981).

Effects of oil acidity on microbial decomposition of organic matter and transformation of nitrogen in an acid forest soil were investigated. In the oak-leaf-amended pH-adjusted acid soils, CO_2 production in 14- and 150-day preincubated samples decreased by about 6 and 37%, respectively. In the control (unamended) acidified soils, reductions in CO_2 production of 14% in 14-day preincubated samples and 52% in 150-day samples were observed. Ammonia formation in the pH-adjusted acid soil was about 50% less than in the naturally acid soil. Increased rates of ammonification and nitrification were observed in the pH-adjusted neutral soil. Little autotrophic and heterotrophic nitrifying activity was detected in naturally acid and acidified forest soils. The rate of denitrification was rather slow in acid soils, and at greater acidities N_2O was the predominant end product. The abundance of nitrogen-fixing free-living bacteria was very low in acidic and acidified forest soils, and nitrogen gains by asymbiotic bacterial fixation in an acid forest ecosystem may be insignificant. These results suggest that further acidification of acid forest soils by addition of sulfuric acid or by acid precipitation may lead to significant reductions in the leaf litter decomposition, ammonification, nitrification, and denitrification and thus reduce nutrient recycling in the forest ecosystem.

27761 **(BNL—29610) Sensitive indicators in the detection of coal workers pneumoconiosis.** Acevedo, J.C.; Susskind, H.; Rasmussen, D.L.; Heydinger, D.K.; Cronkite, E.P.; Goldman, A.G.; Pate, H.R.; Iwai, J.; Yonekura, Y.; Brill, A.B. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 16p. (CONF-810652—6). NTIS, PC A02/MF A01. Order Number DE81025066.

From International symposium on health impacts of different sources of energy; Nashville, TN, USA (22 Jun 1981).

Twenty retired West Virginia coal miners, who presented with respiratory symptoms or radiological changes consistent with coal workers' pneumoconiosis (CWP), participated in a study to identify changes in pulmonary function which occur on exposure to coal dust and to develop improved methods for the early detection of CWP. They underwent a comprehensive series of studies to assess their medical, physiological, and biochemical status. All the miners were life-long non-smokers with a mean age of 58.5 years and an average of 34.1 years' exposure to coal dust. All had dyspnea on exertion, but physical examination showed only minor abnormalities. Chest x rays showed varying degrees of impairment, ranging from normal to complicated CWP. Significant pulmonary impairment was found at the level of the small airways of the lung in all miners, even in the presence of normal chest x rays. This impairment was characterized by a nonuniform distribution of ventilation (Kr-81m scans); abnormal gas exchange manifested by reduced arterial oxygen tensions and increased alveolar-arterial oxygen gradients, but with reduced steady-state CO diffusing capacity at rest discovered in only four miners; and obstruction to air flow in the small airways. In contrast, conventional spirometric measurements

were within the predicted normal limits. A mean ventilation nonuniformity index of 0.179 +- 0.027 demonstrated that V/V/sub a/ for the miners was more nonuniform than that of six normal volunteers who had an index of 0.149 +- 0.003 ($P < 0.001$).

27762 (CONF-801261—1) Environmental effects of the satellite power system microwave power transmission system. Valentino, A.R.; Abromavage, M.M. (Argonne National Lab., IL (USA); Illinois Inst. of Tech., Chicago (USA)). 1980. Contract W-31-109-ENG-38. 6p. NTIS, PC A02/MF A01. Order Number DE81023811.

From National telecommunications conference; Houston, TX, USA (3 Dec 1980).

The potential environmental effects of the Satellite Power System (SPS) Microwave Power Transmission System (MPTS) have been studied as a part of the SPS Concept Development and Evaluation Program (CDEP). A number of issues were identified including: health effects due to microwave exposure for the public as well as the SPS worker; effects on telecommunications due to ionospheric changes caused by the passage of the microwave beam; and electromagnetic compatibility with military systems, radio astronomy, satellite systems, and electronic systems in general. Assessments were prepared based on existing data, and none of the issues precludes the continued study of SPS technology. To increase the certainty of the assessment, some research has been initiated and long-term research is being planned.

27763 (CONF-810247—2) Species variance in the metabolic activation of polycyclic hydrocarbons. Selkirk, J.K.; MacLeod, M.C.; Moore, C.J.; Mansfield, B.K.; Nikbakht, A.; Dearstone, K. (Oak Ridge National Lab., TN (USA); Tennessee Univ., Oak Ridge (USA). Graduate School of Biomedical Sciences). 1981. Contract W-7405-ENG-26. 42p. NTIS, PC A03/MF A01. Order Number DE81023229.

From ICN-UCLA symposia on mechanisms in chemical carcinogenesis; Keystone, CO, USA (22 Feb 1981).

Polycyclic hydrocarbons are metabolized to a series of oxygenated derivatives consisting of dihydrodiols, phenols, and quinones. A comparison of cell-free and intact cell systems show considerable variation for benzo(a)pyrene metabolism depending upon the presence or absence of cytoplasmic transferases for conjugation of these hydroxylated derivatives. Comparative metabolism studies, including microsomes and intact cells from rat, mouse, hamster, and humans yield identical qualitative metabolite profiles with significant quantitative variation. Macromolecular studies of benzo(a)pyrene diol-epoxides in hamster cells show specific binding of 7,8-diol-9,10-epoxide to DNA and 9,10-diol-7,8-epoxide to selected nuclear proteins. Comparative analysis of SDS-polyacrylamide gel electrophoresis suggest a unique specificity for regions of the benzo(a)pyrene molecule at the nuclear level. In addition, studies of carcinogenic 2-hydroxy-benzo(a)pyrene in cell culture were conducted. A diphenol was isolated and characterized as the major product in embryonic fibroblasts. A second minor metabolite was observed. The ratio of these two metabolites was reversed for epidermal cells.

27764 (DOE/MC/11284—T7) Effects of coal combustion and gasification upon lung structure and function. Quarterly progress report, March 12, 1981. (West Virginia Univ., Morgantown (USA). Medical Center). 1981. Contract AT21-79MC11284. 7p. NTIS, PC A02/MF A01.

The overall objective of the proposed research is to correlate both structural and functional alterations in cells and tissues of the lung brought about by exposure to fluidized bed combustion and fixed bed gasification effluents and reagent grade oxides of metals known to be associated with coal combustion and gasification.

27765 (DOE/MC/11284—T8) Effects of coal-combustion effluent on pulmonary carcinogen metabolims. Quarterly progress report. Colby, H.D. (West Virginia Univ., Morgantown (USA). School of Medicine). 8 Jun 1981. Contract AM21-79MC11284. 3p. NTIS, PC A02/MF A01. Order Number DE81023278.

This paper summarizes the direct effects of heavy metals in vitro on pulmonary, hepatic, and adrenal mixed function oxidases including those involved in the metabolism of various carcinogens such as benzo(a)pyrene. Apparent enzyme activity decreased as a function of increasing incubation time for the assay. These observations further illustrate the relevance of the preincubation type experiments described in previous reports. Thus, duration of exposure to metals appears to be an important determinant of the effects on microsomal carcinogen metabolism. Since many heavy metals have extremely long half-lives in tissues in vitro, prolonged duration of exposure may contribute significantly to the toxicity of heavy metals.

27766 (LA-UR—81-963) Method for chronic nose-only exposures of laboratory animals to inhaled fibrous aerosols. Smith, D.M.; Ortiz, L.W.; Archuleta, R.F.; Spalding, J.F.; Ettinger, H.J.; Thomas, R.G. (Los Alamos National Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 34p. (CONF-8010202—1). NTIS, PC A03/MF A01. Order Number DE81024462.

From Inhalation toxicology symposium; Kalamazoo, MI, USA (15 Oct 1980).

A study is currently being conducted to determine any biological effects when rats and hamsters inhale man-made mineral fibers (MMMFs). The MMMF's to be tested include glass fibers, mineral wool, and ceramic fibers, with crocidolite asbestos serving as a positive control aerosol material. A prime objective of this study is to expose animals to high airborne concentrations of long thin fibers. Animal exposures are currently being conducted with a 0.45 μm mean diameter glass microfiber material and the standard UICC crocidolite. A specialized method of restraining rats and hamsters for inhalation exposure was developed providing for aerosol exposure only to the nose and a small fraction of the animal's head. This method eliminates external contamination and prevents animals from burying their noses in their fur to filter out aerosolized particles. Stainless steel chambers have been modified by placing two metal insert panels in place of doors, each containing 45 insert ports for Syrian hamsters or 32 for rats. Animals are loaded into tapered polycarbonate holding tubes and the tubes placed in the panel inserts for exposure. Body weights, rectal temperatures, clinical chemistry profiles, complete blood counts, and plasma corticosterone levels clearly indicate that this technique does not produce measurable stress in the animals.

27767 (LBL—11147-Rev.) Theoretical and observational analysis of individual ionizing particle effects in biological tissue. Nelson, A.C. (Lawrence Berkeley Lab., CA (USA)). Nov 1980. Contract W-7405-ENG-48. 164p. NTIS, PC A08/MF A01. Order Number DE81027088.

Thesis.

This investigation was conducted in an effort to gain a deeper understanding of the microstructural damage to living tissue caused by heavy ion radiation. The corneal tissue of the living rat was exposed to various charged particle beams at different energies. These included beams of carbon at 474 MeV/amu, neon at 8.5 MeV/amu, argon at 8.5 MeV/amu, iron at 500 MeV/amu, and iron at 600 MeV/amu. Additionally, x-rays were used on corneas to compare with the heavy ion irradiated corneas. A chemical fixation protocol was developed to crosslink the membrane proteins within a few seconds post-irradiation. The samples were then subjected to graded ethanol dehydration and liquid carbon dioxide critical point drying. All cornea samples were treated identically in preparation for microscopy. Scanning electron microscopy of corneal epithelium revealed some provoking features of heavy ion irradiation of the tissue. Lesions with circular symmetry were found to occur on the external plasma membranes of corneal epithelium which had been irradiated with heavy ions, but similar lesions were not observed on the plasma membranes of x-ray irradiated or non-irradiated control samples. These data yield experimental verification of the special way in which heavy ions interact with matter: each ion interacts coulombically with electrons all along its trajectory to generate a track.

27768 Comparative toxicity of solid waste leachates to daphnia magna. Millemann, R.E.; Parkhurst, B.R. (ORNL). *Environment International ;* **4**: No. 3, 255-260(1980).

The comparative acute and chronic toxicities of municipal, industrial, coal-fired power plant, and synthetic fuel solid waste leachates to the aquatic invertebrate Daphnia magna were determined.

The acute toxicity 48 hr LC50 estimates ranged from 0.0005% for a dye waste leachate to 100% for a coal gasification waste leachate. The most toxic leachates were derived from a dye waste, a plater's waste, and arsenic-contaminated groundwater.

27769 **Comparative toxicity of solid waste leachates to Daphnia magna.** Millemann, R.E.; Parkhurst, B.R. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Environment International ;* 4: No. 3, 255-260(1980).

The comparative acute and chronic toxicities of municipal, industrial, coal-fired power plant, and synthetic fuel solid waste leachates to the aquatic invertebrate Daphnia magna were determined. Seventeen leachates were laboratory-derived by extraction with 0.5 N acetic acid, and one, an arsenic-contaminated groundwater, was naturally derived. The acute toxicity 48-h LC_{50} estimates ranged from 0.0005% for a dye waste leachate to > 100% (i.e., undiluted) for a coal gasification waste leachate. Of the 16 leachates used in the 28 day chronic toxicity tests, only the arsenic-contaminated groundwater and a municipal sewage sludge significantly affected D. magna reproduction. Generally, the industrial waste leachates were more toxic than those from the power plant and synthetic fuel wastes. Because its presence in the test materials interfered with interpretation of the results, acetic acid may not be an appropriate extraction medium for preparation of leachates.

27770 **Significance of environmental nitrates, nitrites and nitrosamines.** Newberne, P.M.; Nauss, M. (Massachusetts Inst. of Tech., Cambridge). pp 3-15 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Nitrates, nitrites and nitrosamines are widespread in our environment; significant quantities are consumed by broad segments of human and animal populations. Nitrates occur in high concentrations in plants and vegetables, constituting a part of our staple diet. Nitrates are particularly abundant in beets, radishes, celery, broccoli, cabbage and spinach. During adverse weather conditions, such as drought, nitrates accumulate in corn stalks and other plants, creating a hazard for livestock that consume them. Methemoglobinemia is a major risk for infants consuming nitrate and nitrite, principally in water used to bottle formula. Nitrosamines, many of which are animal carcinogens, occur in some meat products, beer and scotch whiskey, but usually in low concentrations (ppB). A major concern is the amount of nitrate/nitrite generated within the human body and recycled via the blood, saliva and gastric secretions. Nitrite produced in this manner may be greater than that consumed in food; it is available for nitrosating dietary amines, thus producing nitrosamines. Blocking factors for such reactions are being studied. In the meantime, we may need to reduce the amounts of nitrate/nitrite we consume.

27771 **Comparison of geochemical and epidemiological data from south eastern Norway.** Bolviken, B. (Geological Survey of Norway, Trondheim); Ottesen, R.T.; Glattre, E. pp 19-26 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Stream sediments have been sampled at a density of 1 sample per 30 km^2 within a 55,000 km^2 area with a population of 450,000. For each of 60 municipalities a composite stream sediment sample has been prepared by mixing equal amounts of all samples taken within the municipality. The composite samples were analyzed for 29 elements. The municipal element concentrations were correlated with municipal cancer death rates obtained from the Central Bureau of Statistics, and special mortality rates for pernicious anemia, multiple sclerosis and mb. Parkinson, supplied to us by Westlund. Several positive and negative associations occur in the data. The best linear correlation between trace element and disease was found for concentration of Cu vs. mortality of cancer of the digestive organs, the correlation coefficient being -0.47 ($p < 0.005$).

27772 **Cadmium at Shipham: a unique example of environmental geochemistry and health.** Thornton, I. (Imperial College, London, England); John, S.; Moorcroft, S.; Watt, J.; Strehlow, C.D.; Barltrop, D.; Wells, J. pp 27-37 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

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As reported at the 13th Annual Conference, extremely large concentrations of cadmium and zinc have been found in agricultural and garden soils around the village of Shipham in southwest England, ranging up to 800 μg/g Cd and 70,000 μg/g Zn. Metals are present as contaminants from zinc mining activities from 1700 to 1850. Comprehensive environmental health studies in and around the village have been co-ordinated by the Department of the Environment. These include detailed sampling of soils, house and road dusts, air and vegetables, a study of diets of the local population and measurement of metals and/or various biological indices in blood, urine and hair of adults and children. This paper describes the results of the investigations to date.

27773 **Selenium, cadmium and glutathione peroxidase in blood of cardiovascular diseased and normal subjects from the cardiovascular belt of southeastern USA.** Andrews, J.W.; Hames, C.G.; Metts, J.C. Jr.; Davis, J.M. (Community Cardiovascular Council, Savannah, Georgia). pp 38-42 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

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Selenium levels in erythrocytes and plasma from long-term residents of an urban and a rural area of coastal Georgia reflected previously reported low environmental Se levels. Plasma Se levels of adults were less than 2/3 of previously reported values from the US. High school seniors from the urban area had slightly higher Se levels in blood. There were no significant differences ($p > 0.05$) in Se status of hypertensive and normotensive seniors, nor in cardiovascular diseased or normal adults. Cadmium levels in blood from residents of the urban area were 4-fold higher than from the rural area. Erythrocyte glutathione peroxidase (Ec 1.11.1.9) levels in the urban area were significantly lower and were negatively correlated with erythrocyte Cd levels ($p < 0.01$).

27774 **Lung cancer, wetlands and hydrogen sulfide.** Hitchcock, D.R. (Hitchcock Associates, Farmington, CT). pp 43-50 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; Universtiy of Missouri (1980).

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Lung cancer mortality rates were studied in relation to bacterial hydrogen sulfide production in flooded sediments, and to occupational exposure to elevated H_2S levels in oil and gas fields in order to explore a postulated link via the respiration of particulate sulfate produced by atmospheric reactions from H_2S. White male and female rates varied systematically with indices of bacterial sulfide production in all regions studied (5 Atlantic coast states, Texas and 44 states plus District of Columbia). White male rates varied with % male employment in oil and gas fields in ways that imply that H_2S exposures strongly influence the geography of lung cancer risks to both sexes and increase lung cancer risks to smokers more than to nonsmokers.

27775 **Factors associated with normal lead concentrations in rib.** Krailo, M.D.; Brown, K.S.; Cherry, W.H.; Forbes, W.F. (Univ. of Waterloo, Ontario). pp 51-58 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; Universtiy of Missouri (1980).

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An extensive set of documented rib samples has been collected with the aim of estimating the lead levels in rib for the Canadian population, and of investigating the factors which are associated with these Pb concentrations. For 87 male smokers, multiple regression analyses were carried out and after investigating a number of models, it was determined that a model containing 7 terms fitted the data best. This model was then constructed in a stepwise

manner and the variables pack-years smoked, occupation, cancer as a cause of death, frequency of smoking, ash fraction of wet weight, an (age)^2 term, and the birth year after 1920 were entered in this order. The total variation in Pb concentration explained is approximately 46%. These results suggest that in future studies of Pb in human tissue, donor smoking histories, occupational histories and indicators of environmental exposure should be obtained in order that the variabilty in concentration may be investigated more fully.

27776 **Possible use of metallogenic criteria in the study of mortality in the eastern United States.** Kutina, J. (American Univ., Washington, DC). pp 59-68 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; Universtiy of Missouri (1980).

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The high all-causes mortality areas of the Eastern United States have been compared with a set of new maps showing the distribution of individual metals and minerals in the region. The mortality cluster of eastern Pennsylvania correlates, in general, with both the area of anthracite mining and with a cluster of uranium occurrences. The high-mortality belt of the Southeast extends essentially parallel to the thorium-bearing monazite belt of the Piedmont. The monazite placers in the Aiken District at Savannah River and those in southeast Georgia correlate with high mortality areas in Sauer's map. A detailed study is recommended to distinguish whether the above correlations are accidental or are related to long-term effects of low level radiation of U and Th as additional parameters in the control of the mortality rates.

27777 **Nutritional and other factors influencing the response of animals and human subjects to trace element deficiency or excess.** Mills, C.F. (Rowett Research Inst., Aberdeen, Scotland). pp 71-79 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

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The responses of animals and human subjects to trace element deficiencies or excesses originating from anomalies in the trace element composition of their diet or environment are influenced by the stage of development at which exposure occurs, by dietary composition and by factors operating at the soil-plant interface which modify the impact of such anomalies on the food chain. It is suggested that the sensitivity of some investigations of the relationship of the geochemical environment to human and animal health might be increased if the existence of such factors was recognised at the planning and interpretative phases of such investigations.

27778 **Human milk and zinc bioavailability.** Casey, C.E.; Hambidge, K.M.; Walravens, P.A. (Univ. of Colorado, Denver). pp 80-84 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

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Several observations suggest that the bioavailability of zinc with human milk compares favorably with cow's milk and its products. Despite the relatively low Zn content, mature human milk is effective in raising plasma Zn concentrations and achieving clinical remission in acrodermatitis enteropathica (AE). This enhanced availability of Zn may be due to a low molecular weight Zn binding ligand, the identity of which has been suggested recently as citrate or picolinate. Using a Zn loading test, Zn uptake was examined in normal subjects and AE patients. The plasma Zn response after a 25-mg Zn dose taken with toast was not different in the 2 groups, nor was it enhanced by the addition of citric acid or picolinic acid (in a 2:1 ratio) to the Zn dose. In normal subjects, the response to a 25-mg Zn dose with breast milk was 3-fold greater than with an equivalent amount of cow's milk. Addition of citric acid or picolinic acid to the cow's milk did not increase this response.

27779 **Bioavailability to quail of zinc in salts, food additives and supplements for humans.** Tao, S.H.; Sheu, S.; Johnson, M.L.; Fry, B.E. Jr.; Fox, M.R.S. (Dept. of Health and Human Services, Washington, DC). pp 85-93 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

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The bioavailability of zinc in salts, food additives and selected commercial Zn supplements for humans was studied. Day-old Japanese quail (Coturnix coturnix japonica) were fed a nutritionally adequate control diet for 7 days. From 7 to 14 days, a tibia Zn standard response curve was established by adding 2.5, 5, 10 and 20 ppM of Zn as zinc carbonate to the basal low-zinc diet (11.4 ppM of Zn). A linear relationship was observed over the range of 2.5 to 20 ppM of added dietary Zn. The basal diet was supplemented with each test compound at the 3 lower levels within this range, and the relative biological value (RBV) was calculated by the parallel line method (zinc carbonate = 100%). Body and tibia weights were not affected by either dietary Zn levels or sources. The following RBVs (%) were obtained: zinc acetate (reagent) 104, ZnO (reagent) 118, ZnO (USP) 112, $ZnSO_4 \cdot 7H_2O$ 126, high-zinc yeast protein 102, commercial tablet (CT) chelated zinc 111, CT zinc gluconate 94, CT chelated zinc with hydrolyzed protein 100, zinc stearate (USP) 111, commercial (C) zinc stearate 114, C zinc stearate encapsulated ferrous sulfate (supplied 32.7, 63.4 and 127.8 ppM of Fe) 102, and CT ZnO plus other minerals and vitamins 114. The Zn in all of these substances and formulations was as biologically available as that in zinc carbonate, an optimally available form.

27780 **Effect of aluminum on fluoride and calcium metabolism in man.** Spencer, H.; Kramer, L.; Norris, C.; Osis, D.; Wiatrowski, E. (Veterans Administration Hospital, Hines, IL). pp 94-102 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

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The effect of aluminum hydroxide, an antacid commonly used in clinical medicine, on the metabolism of fluoride and calcium has been investigated in adult men. The intake of small doses of aluminum hydroxide (30 ml 3 times daily) containing a total of 1.8 g Al markedly increased fecal fluoride excretion, by a factor of 10 to 40, thereby inhibiting the intestinal absorption of F. These relatively small doses of Al-containing antacids also reversed the normal pattern of phosphorus excretions. These changes were associated with a negative Ca balance primarily due to an increase in urinary Ca but also in fecal Ca excretions. The increase in urinary Ca was not due to increased intestinal absorption of Ca during P depletion and is most likely a result of increased bone resorption.

27781 **Trace element nutriture response of adult men consuming dephytinized or non-dephytinized wheat bran.** Morris, E.R. (Dept. of Agriculture, Beltsville, MD); Ellis, R.; Steele, P.; Moser, P. pp 103-109 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

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Ten healthy adult men consumed diets for 2 15-day periods that included 36 g of wheat bran each day. Five subjects received dephytinized wheat bran the first 15 days followed by whole (nondephytinized) wheat bran the second 15 days and 5 received the 2 types in the opposite sequence. When dephytinized bran was consumed, the phytate intake (0.2 g/day) was one-tenth the intake when nondephytinized bran was consumed, but the total inorganic nutrient and neutral detergent fiber intakes did not differ. Mean apparent absorptions (intake-fecal excretion) of the trace elements iron, zinc, manganese and copper tended to be lower, but positive, for the initial 5 days than for the concluding 10 days when dephytinized bran was consumed. The same pattern occurred when whole bran was consumed, but the 5-day means for Fe, Zn and Mn were negative and the 10-day means were more positive than when dephytinized bran was consumed. The response patterns may reflect adaptation of some type, but the overall results indicate that the phytate in 36 g of wheat bran each day did not exert a detrimental effect on trace element nutriture in this study.

27782 **Modified food starch: effects on mineral availability in rats and hamsters.** Buttolph, M.L.; Newberne, P.M. (Massachusetts Inst. of Tech., Cambridge). pp 116-128 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

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Selected modified food starches added to the diets of Syrian Golden hamsters were associated with a renal lesion consisting of tubular dilation and cortical scarring. The incidence and severity of the lesion were dependent on the type and degree of modification of the starch and the magnesium content of the diet; increased dietary Mg inhibited or prevented the morphologic expression of the lesion. This observation led to a series of similar studies in rats where both the carbohydrate and dietary mineral content of the diets were varied. The renal lesion observed in these rats consisted of tubular mineralization at the corticome-dullary junction. This lesion differed from the hamster lesion and was more dependent on the calcium/phosphorus ratio and levels than Mg content or the type of modified food starch in the diet. It is concluded that modified food starch ingestion increases the Mg requirement of hamsters, but a more complex mineral-carbohydrate interaction is apparent in rats fed modified food starch.

27783 **Assessment of metal availability in soil through the evaluation of bacterial metal resistance.** Troyer, L. (Univ. of California, Irvine); Olson, B.H.; Hill, D.C.; Thornton, I.; Matthews, H. pp 129-141 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

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The data presented in this investigation suggest that metal-resistance patterns of bacterial populations could be used as indicator systems of metal pollution in soils. Multiple metal-resistant patterns for total bacterial populations have been determined for metal-enriched agricultural soils in Somerset and Derbyshire, England. The 11 sites in Somerset contain background to high levels of cadmium, zinc and lead. The source of the metal contamination is from zinc mining practices between 1700 and 1850. Bacteria isolated from these sites exhibited metal resistance patterns reflecting the total and water soluble metal content of the corresponding soil site. Of the bacterial populations tested from control and Cd enriched soils 29 to 95% were resistant to 20 mg/kg Cd. The proportion of bacterial population resistant to 100 mg/Kg Cd ranged between 1 to 10% for soils containing $>$ 50 mg/kg Cd and dropped to $<$ 0.5% of the population for soils containing $<$ 50 mg/kg. When the test concentration of Cd was increased to 200 mg/kg the resistant population in low Cd soils ($<$50 mg/kg) decreased to 0.004% of the total population, while in Cd-enriched soils ($>$50 mg/kg) the resistant population represented 0.7 to 2.0%. Similar resistant patterns to Zn have been demonstrated for the bacterial populations from the Somerset pasture soils. Pasture soils collected in Derbyshire have been contaminated with Pb from mining activities from Roman times until the beginning of the 19th century. The proportion of the bacteria resistant to Pb, Cd, Zn, Cu and Ni was assessed. The data indicated that the resistant bacterial population accurately reflected the soil habitat from which it was isolated.

27784 **Monitoring the bioavailability of toxic metals in acid-stressed shield lakes using pelecypod molluscs (clams, mussels).** Forester, A.J. (Univ. of Toronto, Ontario). pp 142-147 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

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Measurement of total or nominal pollutant concentration in the physical compartments of the aquatic environment (water, sediments, etc.) seldom gives a valid indication of the ultimate threat to the ecosystem. An alternative is to use a living organism to reflect the biological availability of the contaminant and to integrate its changing levels in the environment by monitoring over an extended period. Pelecypods have been used as indicators of marine, coastal pollution but have received relatively little attention in freshwaters. The large unionacean clams and mussels show a number of features which suggest that they would be useful as monitors of biological availability of freshwater pollutants: ability to accumulate a wide variety of contaminants; mode of feeding; position on food chain; longevity; sedentary habits; facility with which their age can be determined; abundance; distribution; size and hardiness. The current program is concerned with: (1) evaluating unionaceans as potential indicators and the factors that affect pollutant uptake; (2) development of the methodology for monitoring; (3) characterization of the pollutant status of Ontario shield lakes which are subject to both direct inputs of toxic metals with precipitation and their mobilization through the ecosystem as a secondary function of environmental acidification.

27785 **Modulation of human lymphocyte transformation by cadmium and lead.** Balter, N.J.; Matarazzo, W.J.; Gallagher, K.; Monos, D.; Strasburg, S.; Gray, I. (Georgetown Univ., Washington, DC). pp 167-174 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Human peripheral blood lymphocytes (PBL) were exposed to cadmium and lead as their chloride salts at concentrations of 10^{-7}, 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}M. Following a 72-hr incubation period, toxicity and unstimulated and Con A-stimulated lymphocyte transformation were assessed by measuring the following parameters: cell viability and DNA, RNA and protein synthesis. Cadmium, 10^{-4} and 10^{-3}M, was associated with a 40 to 50% reduction in cell viability; lower Cd^{+2} concentrations and all concentrations of Pb^{+2} tested had no effect on cell viability. In both unstimulated and Con A-stimulated lymphocyte cultures, Cd^{+2} at 10^{-4} and 10^{-3}M was associated with a total inhibition of DNA, RNA and protein synthesis. At 10^{-7} to 10^{-5}M, Cd^{+2} was slightly inhibitory for macromolecular synthesis except in unstimulated cultures where DNA synthesis was enhanced. Lead increased DNA synthesis and slightly inhibited RNA and protein synthesis in unstimulated lymphocyte cultures and had no effect on Con A-stimulated cultures except at 10^{-3}M where DNA, RNA and protein synthesis were all inhibited.

27786 **Cytotoxic lymphocyte responses in mineral deficient conditions.** Flynn, A.; Yen. B.R. (Cleveland Clinic Foundation, OH). pp 175-181 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

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Generation of cytotoxic T-cell response of splenocytes was studied in vitro under copper, magnesium and zinc deficient conditions. Viability of the short-term lymphocyte cultures in the deficient media was comparable with control condition viability. Cell mediated lympholysis was analyzed in an alloantigen stimulated mixed lymphocyte culture (Balb/c vs. CBA/H) using a ^{51}Cr release assay. Copper and Mg deficient lymphocytes failed to generate specific lysis to allogenic target cells, whereas Zn deficient cells did generate T-killer cell activity at reduced levels.

27787 **Methyl and inorganic mercury levels in maternal-placental-fetal tissue sets.** Kuhnert, P.M.; Kuhnert, B.R.; Erhard, P.; Prochaska, A.L. (Case Western Reserve Univ., Cleveland, OH). pp 182-188 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

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In humans, approximately 30% more mercury may be found in fetal cord blood than in maternal blood during pregnancy. The primary form is believed to be methylmercury, but this has only been inferred from animal studies because sensitive analytical techniques capable of distinguishing the form of mercury in normally exposed populations have not been available. In the present study, a gas chromatographic procedure was used to determine the concentrations of methyl- and inorganic mercury in the erythrocytes and placentas of 29 human maternal-placental-fetal tissue sets. Significantly more MeHg was found in fetal erythrocytes than in maternal erythrocytes, and significantly more inorganic Hg was found in maternal than fetal erythrocytes. A significant difference was also observed between the amount of methyl- and inorganic Hg in the placenta and in the fetal erythrocytes. Overall, the relative mean con-

centrations of MeHg in the tissues studied were: cord erythrocytes > maternal erythrocytes > placenta. For inorganic Hg, the relative mean concs were: placenta > maternal erythrocytes > fetal erythrocytes. Also, a significant correlation (r = .87) was observed between maternal and fetal erythrocyte MeHg levels, but not for inorganic Hg levels. These results indicate that MeHg accumulates in fetal cord erythrocytes during pregnancy, and that the human placenta appears to act as a barrier for the transport of inorganic Hg but not for MeHg.

27788 **Lead vs. magnesium in dietary induction of rat tumors.** Galt, R.M.; McCreary, P.A.; Laing, G.H.; Hass, G.M. (Rush-Presbyterian-St. Luke's Medical Center, Chicago, IL). pp 189-194 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

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Male post-weanling Sprague-Dawley rats were fed a synthetic diet containing different concentrations of lead and magnesium for as long as 72 weeks. Among 362 fed a diet (3 to 5 mg% of Mg and a trace of Pb) 64 developed lymphoma-leukemia, 8 a myeloid leukemia and 2 a lymphatic leukemia. Among 74 rats fed a diet (3 to 5 mg% of Mg and 80 mg% of Pb) 24 developed small renal adenomas and 4 a myeloid leukemia. Among 421 rats fed a diet (65 mg% of Mg and a trace of Pb) 4 developed a lymphatic leukemia. Among 112 rats fed a diet (65 mg% of Mg and 80 mg% of Pb) 58 developed renal adenomas and 31 had renal cortical carcinomas. Therefore, induction of lymphoma-leukemia by the deprivation of Mg was prevented by addition of excess Pb to the diet, while induction of large renal adenomas and carcinomas by excess dietary Pb was prevented by the deprivation of Mg.

27789 **Effect of ingested lead on tissue levels of copper, iron, zinc and manganese in rats.** Mylroie, A.A. (Chicago State Univ., IL). pp 195-202 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

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Conflicting results have been reported in the literature regarding the effects of lead ingestion on the concentration of essential trace metals in tissues. This experiment was designed to ascertain the effects of dietary Pb (0, 500, 1000 ppM) on tissue levels of Cu, Zn, Mn and Fe in rats fed a purified diet (AIN-76) containing adequate amounts of trace metals. Groups of 30-day-old rats were given lead acetate in the drinking water for 5 weeks. Lead-induced anemia was used as an index of Pb toxicity and was measured by changes in red blood cell count, hematocrit and hemaglobin values and mean corpuscular volume. Reduction in these parameters occurred at both levels of Pb intake. The following changes in trace metal concentrations were observed in tissues of Pb-treated rats compared to control animals: (1) Cu concentrations were reduced by 20 to 60% in blood, kidney, liver and spleen; (2) Mn concentrations were reduced by 20% in kidney, but not in liver; (3) Zn concentrations were not changed significantly and (4) Fe levels were increased by about 400% in spleen and 60% in liver. Trace metal concentrations in the brain were not altered by Pb intake.

27790 **Cadmium, selenium and zinc levels in kidneys.** Shamberger, R.J.; Bratush, C.M. (Cleveland Clinic Foundation, OH). pp 203-210 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

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Cadmium, selenium and zinc levels were measued from the subscapular region of the kidney cortex from 123 patients who died from different diseases. Selenium was lower in patients with cancer metastases. Cancer patients also showed a trend toward a lower Se. Zinc was significantly greater in kidneys from patients with cancer or patients with cancer and metastases. The Zn/Se ratio had a greater significant difference from controls than did Se or Zn alone. Male and female non-smokers and cigar smokers had a significantly lower kidney Cd content than cigarette smokers. Non-smoking cancer patients with metastases had a greater kidney Cd content than non-smokers with other diseases. Hypertensive and atherosclerotic non-smokers, renal patients and non-whites did not have a significantly greater Cd content than did patients with other diseases. The Cd/Se ratios were greater in cancer patients and cancer patients with metastases than the controls. There was a positive significant correlation between Zn and Cd in 123 patients.

27791 **Zinc, copper, seminal volume, count, viability and luteinizing hormone correlations in a male infertility study.** Sella, G.E.; Cunnane, S.C.; McInnes, R.A. (McGill Univ., Montreal, Quebec). pp 217-231 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

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During the past decade a number of researchers and clinical investigators in the field of human (male) infertility have added to their protocol the study of a number of essential trace and other elements. Zinc is an essential trace element. It is secreted to a several-fold concentration from the plasma to the prostate gland and hence to the seminal fluid. It appears increasingly clear that Zn has a number of functions within the context of male sexual activity. The corollary has also been shown beneficial in a few studies conducted on the subject. The data presented in this article represent an amplification of an original pilot study of male infertility. The project has been designed to investigate and correlate a number of clinically established and less established components or factors of male fertility, Zn being as yet among the latter.

27792 **Intestinal absorption and tissue uptakes of ^{65}Zn during different single oral doses of calcium.** Lender, M.; Rubenstein, M.; Menczel, J. (Veterans Adminstration Hospital, Hines, IL). pp 232-237 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

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The effect of different intakes of calcium on the metabolism of radiozinc was studied in relation to absorption and skeletal uptake of Zn in the rat. Tracer doses of ^{65}Zn as the chloride and different doses of stable Ca as the chloride were given simultaneously by gastric intubation to 3 groups of rats. Three concentrations of Ca were used: 0.05%, 0.5% and 2.5%. The rats were sacrificed at 1, 4 and 24 hours after simultaneous administration of the $CaCl_2$ solutions and ^{65}Zn. The entire ligated gastrointestinal tract, tibia and sternum as well as soft tissues were obtained for radioassay. The intestinal absorption of ^{65}Zn was expressed as percent of the administered dose and was determined from the gastrointestinal content at 1, 4 and 24 hr after the oral tracer dose of ^{65}Zn. The low (0.05%) and normal (0.5%) Ca intakes had no effect on the absorption of ^{65}Zn at the different time intervals. The high Ca intake (2.5%) at 1 and 4 hr was associated with a decrease in ^{65}Zn absorption while at 24 hr the absorption of ^{65}Zn was significantly higher, 63.3% vs. 33.6% on the 0.5% Ca intake ($p < 0.01$). The ^{65}Zn absorption at 24 hr was also greater during the highest Ca intake than at 4 hr, 22.0% ($p < 0.001$). The ^{65}Zn uptake in the tibia at 24 hr during the high Ca intake of 2.5% was increased, 0.86% vs. 0.43%/g, during a normal Ca intake (0.5%). The initial decrease of intestinal absorption of ^{65}Zn during a high Ca intake may be due to changes in the ionic form of Zn^{++} and interference with its binding to plasma albumin.

27793 **Changes in respiratory activity of liver mitochondria after chlorine treatment.** Shau, J.H.; Vogt, C.R.; Sun, G.Y.; Sur, A.Y. (Univ. of Missouri, Columbia). pp 238-244 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

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Using purified mitochondrial particles from rat liver we have examined the effects of chlorine on the structure and function of mitochondrial membranes. Mild Cl treatment (0-6 ppM) of liver mitochondria did not seem to alter the protein profile after SDS-gel electrophoresis, nor the acyl group composition of membrane lipids. However, the rate of state 3 oxygen consumption, respiratory control ratio and oxidative phosphorylation were inhibited

after such treatment. The alteration of micro-environment of mitochondrial enzymes may be responsible for the observed change.

27794 **Increased renal copper after administration of aurothioglucose.** Bogden, J.D.; Kemp, F.W.; Zadzielski, E.; Jortner, B.S. (New Jersey Medical School, Newark). pp 245-251 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Male Swiss-Webster mice were given intraperitoneal injections of the gold-containing drug aurothioglucose in saline at 3 doses: 50, 200 and 400 mg/kg. Other groups of mice were given ip injections of silver nitrate (10 mg/kg) or uranyl nitrate (3 mg/kg) in saline. Controls received ip injections of saline. The injections were administered over a 3-week period. After sacrifice, kidney and liver concentrations of gold, silver, copper, zinc, iron and manganese were determined by atomic absorption spectrophotometry. Dose related increases in liver and kidney Au were found and kidney Cu also increased significantly with increasing renal Au content. Kidney Cu was 5.05 +- 0.80 ppM in control animals and 7.81 +- 1.11 ppM, 13.01 +- 2.49 ppM and 17.11 +- 4.02 ppM in mice receiving 50, 200 and 400 mg/kg aurothioglucose respectively. Renal Zn and liver Zn and Cu were also significantly ($p < .01$) increased in mice receiving the highest dose of aurothioglucose. Animals receiving silver nitrate had significantly lower kidney Mn concentrations. Mice receiving uranyl nitrate had significantly depressed kidney concentrations of Cu, Mn and Fe. No other significant differences in tissue metal concentrations were found. The results for aurothioglucose are consistent with the hypothesis that increased renal Cu may play a role in the nephrotoxicity of Au-containing drugs.

27795 **Anticonvulsant copper complexes.** Sorenson, J.R.J.; Stull, R.E.; Ramakrishna, K.; Johnson, B.L.; Riddell, E.; Ring, D.F.; Rolniak, T.M.; Stewart, D.L. (Univ. of Arkansas, Little Rock). pp 252-264 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

The anticonvulsant activities of copper complexes of some amino acids, 4-substituted salicylates and salicylidene-amino acids as well as biscarbonylethylenediamine Schiff bases are presented. Since $Cu(II)_2$ (aspirinate)$_4$ had been shown to have anticonvulsant activity, both aspirin and copper acetate were tested. The results, along with data reported last year, support the hypothesis that the Cu complex of aspirin mediated the observed anticonvulsant activity. Anticonvulsant activities of sodium amobarbital and Cu(II)-(amobarbital)$_2$ are presented in support of the hypothesis that the active form of this antiepileptic drug in vivo is its Cu complex.

27796 **Cadmium as both an antinatriuretic and a pressor agent.** Perry, H.M. Jr.; Erlanger, M.W. (Washington University, St. Louis, MO). pp 280-286 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Long-term, low-level cadmium ingestion induces an average increase of 15 to 20 mm Hg in indirectly measured systolic pressure of lightly anesthetized rats. The mechanism of this increase is not known with certainty, but Cd has several potentially pressor effects, including increased sodium retention. The experiments cited here demonstrate that various Cd challenges induce the combination of hypertension (HT) and Na retention. Thus, rats fed nontoxic amounts of Cd developed HT and retained more of an injected test dose of radiosodium than controls. Moreover, following parenteral Cd, rats both accumulated dietary radiosodium more rapidly and lost it more slowly than controls. These data indicate that some of the pressor effect associated with Cd exposure could result from its concomitant antinatriuretic effect. Excess NA feeding, however, did not further increase Cd-induced HT, suggesting that by retaining the NA present in the standard diet, Cd might already be inducing something close to the maximum pressor effect it could induce by Na retention. Unexpectedly, however, feeding excess Na to young rats did produce HT in adults long after the excess Na had been withdrawn. Thus, control rats with no Cd exposure given 1% NaCl in their drinking water for 4 months after weaning were hypertensive at the end of exposure, normotensive at 6 and 8 months and hypertensive again at 12 and 16 months.

27797 **Selenium-induced cataract.** Shearer, T.R.; Britton, J.L. (Univ. of Oregon, Portland). pp 287-293 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

A histologic examination of cataractous lenses from suckling rats receiving excess selenium showed mature nuclear cataracts, sometimes with cortical involvement, and extensive vacuolization of the lens cortex. Preliminary data suggest that the simultaneous administration of cadmium may ameliorate the cataractogenic ability of Se. In another animal species, the hamster, excess Se did not appear to be cataractogenic. The results are discussed in terms of future research necessary for a more complete understanding of the mechanism of Se-induced cataract.

27798 **Mental retardation and related conditions: diagnosis and treatment.** Cameron, W.R.; Wunderlich, R.C. Jr.; Loop, A.S. pp 294-298 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Hair samples were analyzed from 110 patients including 7 mentally retarded, 66 learning disabled and 57 hyperactive children, ages 1 to 19 years. It was found that significantly high levels of lead and mercury prevailed in the hair of male and female patients, and cadmium was at the top of the tolerable limit. In the nutrient elements copper and cobalt were above the normal range, while sodium was slightly below. A 6-hr glucose tolerance test and appropriate tests for allergies indicated that 82% were suffering from hypoglycemia and a very high proportion had allergies of various forms. Home visits frequently aided in establishing the source of toxic elements. Whenever possible these were removed or the patient left the area. A remarkable improvement in the health and social adjustment occurred in the patients - after varying lengths of time when contact with the toxic elements was stopped, the nutrient elements were restored to their normal levels, and hypoglycemia as well as the allergies were brought under control.

27799 **Sources of high aluminum levels in chronic hemodialyzed patients.** Zumkley, H.; Bertram, H.P.; Graefe, U.; Langer, K. (Univ. of Muenster, Germany). pp 299-303 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Plasma aluminum concentrations were determined in 20 patients treated with home dialysis (HD) and 20 undergoing limited care dialysis (LCD). Home dialysis as compared to limited care patients had significantly higher plasma Al levels. It could be demonstrated that the cause for this difference is the higher Al concentrations in the dialysate of home dialysis patients. The dialysate Al concentration in limited care dialysis was very low (> 1.0 ng/l), because the dialysate was treated by reverse osmosis. In contrast dialysate Al from patients dialyzed at home ranged from 1.0 to 60 ng/l. It could be excluded that the difference in plasma Al concentrations was caused by different doses of oral Al. The oral aluminum hydroxide intake was comparable in both groups. However, the intake of oral phosphorus binders is significantly correlated to plasma levels of Al so that caution should be recommended when prescribing drugs containing aluminum hydroxide for patients on chronic intermittent dialysis.

27800 **Concentrations of trace elements in human tissue.** Hopps, H.C. (Univ. of Missouri, Columbia). pp 304-311 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

This presentation is based in part upon the considerable effort in planning a 3-day workshop which was held 28 to 30 May 1980 in College Park, MD but is in no sense a summary report of that workshop. Its purpose was to evaluate critically the current state of our knowledge about the amounts and chemical states of the various nutritionally significant minerals and elements in human tissues, to determine whether or not we need a more effective data base and, if deemed appropriate, to establish guidelines for obtaining the necessary additional data. The condition of primary concern was health, not disease.

27801 **Extraction characteristics of a poly (dithiocarbamate) resin prepared under various reaction conditions.** Bray, J.T.; Reilly, F.J. Jr.; Bates, J.M.; van Rij, A.M.; Pories, W.J. (East Carolina Univ., Greenville, NC). pp 375-382 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Modified preparations of the poly(dithiocarbamate) chelating resin, recently described in the literature, were investigated for their applicability to trace element analysis by inductively coupled plasma spectrometry, including a number of elements for which no previous data have been reported. This study examined the pH dependent response of these elements to the chelation characteristics of the various resin preparations. Condensation of the polymers using tetrahydrofuran rather than dioxane and the use of different resin particle size ranges for extraction does not appear to affect the analytical results.

27802 **Pitcher plant mosquito, Wyeomyia Smithii, a recent introduction to the bioassay laboratory.** Lillie, T.H. (Occupational and Environmental Health Lab., Brooks AFB, TX); Campbell, J.M.; Thalken, C.E.; Lang, J.T. pp 383-389 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

In nature, the pitcher plant mosquito Wyeomyia smithii breeds exclusively in the water-filled leaves (pitchers) of Sarracenia purpurea, the common pitcher plant of peat bogs. It is an autogenous, non-bloodfeeding species which begins egg formation in the larval stage. Adult females are able to complete egg formation without food or blood ingestion; however, carbohydrate ingestion will increase adult longevity. The unusual life cycle makes this mosquito particularly suited for laboratory breeding and bioassay studies. In our studies, the egg-to-egg cycle was completed in less than 30 days at 27 +- 1°C, 60 +- 3% relative humidity and 16 hours incandescent light. Adults were fed 10% sugar water on cotton wicks, while larval stages were fed TetraMin tropical fish food, catfish grower and dog chow. Larvae were maintained in water-filled, plexiglass-covered plastic pans. Pupae and adults were maintained in Cornell Mosquito Cages. We have used Wy. smithii larvae to evaluate the toxicity of various compounds, to determine water quality following fish kill incidents and to evaluate the effectiveness of outdated pesticides.

27803 **Comparison of low temperature and dry ashing in the determination of chromium in human milk and urine by graphite furnace atomic absorption spectrophotometry.** Kumpulainen, J. (Univ. of Helsinki, Finland). pp 405-413 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

A Perkin-Elmer 703 AA spectrophotometer equipped with an HGA-500 graphite furnace and a D_2-background corrector were employed for methodological experiments to determine chromium in human milk and urine. Using porcelain crucibles, it was found that dry ashing at 500°C consistently resulted in almost twice as high values for Cr concentration in these samples than those of low temperature ashing (LTA). Using quartz crucibles and by addition of 2% of concentrated H_2SO_4 to the samples before ashing, values similar to those of the LTA procedure were obtained for both urine and milk. For the LTA procedure, by using a ^{51}Cr addition, recoveries of 97.6 +- 2.1% and 98.6 +- 0.8% were obtained for milk and urine, respectively. Therefore, it was concluded that LTA was the correct ashing method for human milk and urine, and it was employed in subsequent analyses. Erroneously high Cr values result when using dry ashing because at elevated temperatures in the presence of alkaline salts, Cr is leached from the walls of porcelain crucibles. This is probable due to a fusion type of reaction and can significantly contaminate the analysis when the concentration of Cr in a biological sample is at the level of 1 ppB. In blank crucibles, leaching cannot take place. The concentration of Cr was 0.82 ppB in a urine pool prepared from 24-hr urine samples of 9 healthy individuals. The mean conc of Cr in the breast milks of 20 Finnish lactating mothers was 0.40 +- 0.15 ppB, with a range of 0.19 to 0.69 ppB. This is more than one order of magnitude lower than the values for Cr in human milk previously reported.

27804 **Chlorination of organic compounds in water and physiological systems.** Liao, J.C.; Vogt, C.R. (Univ. of Missouri, Columbia). pp 414-421 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Chlorine has been widely used to disinfect drinking water. Moreover, residual chlorine in drinking water is required to preserve the quality of the finished water up to the point of consumption. The amount of chlorine left in the water is based on the source of the raw water being treated. Previous results in our laboratory show that chloroform was accumulated in rat tissues after administration, in vivo, of chlorine water. the purpose of this investigation was to study the parameters in haloform formation. These parameters include the concentration of the reagent, the pH profile of the reaction media, the reaction time and different sources of water-soluble organics. Better understanding of haloform formation could help to monitor the chlorination conditions in water treatment plants to reduce the presence of toxic haloforms in drinking water. We also studied the reaction of rats when administered chlorine water under both in vivo and in vitro conditions.

27805 **Study of methoxyflurane levels in veterinary operating rooms with and without waste anesthetic gas scavenging.** Milligan, J.E.; (Occupational and Environmental Health Lab., Brooks Air Force Base, TX); Sablan, J.L.; Croy, J.F. pp 436-443 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Veterinarians, their assistants and animal researchers should consider the potential health hazards of chronic exposure to the inhalational anesthe tic, methoxyflurane. The high fat-solubility of methoxyflurane results in the availability of a depot of drug for prolonged postexposure biotransformation and possible long-term susceptibility to the toxic effects of its metabolites. Adverse human health effects following chronic exposure to methoxyflurane may include nephrotoxicity, hepatotoxicity, teratogenesis and carcinogenesis. The exposure level of medical personnel to methoxyflurane in operating room air is well documented. There are, however, few reports of the potential hazard to veterinary personnel. The present study was conducted to determine the exposure levels to methoxyflurane in a veterinary surgery. Real-time analyses were obtained utilizing infrared spectrophotometry. Measurements were made both during scavenging and not scavenging of the waste anesthetic gas. The mean level of methoxyflurane during scavenging was significantly different from the mean during not scavenging. Furthermore, the 95% upper confidence limit for the scavenged mean was within the 2 ppM standard for methoxyflurane recommended by the National Institute for Occupational Safety and Health. The 95% upper confidence limit for the not scavenged mean was well above that standard. Therefore, protection of veterinary personnel and animal researchers form chronic exposure to methoxyflurane vapors seems advisable and achievable. Complete waste anesthetic gas management and periodic monitoring programs should be established to protect personnel involved.

27806 **Field study on the depuration of PCBs by Mercenaria mercenaria.** Deuber, K.H. (Univ. of Massachusetts, East Wareham); Corte-Real, I.; Rule, P. pp 444-448 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

The objective of this study was to estimate the time required in the field and under broad-range temperature conditions to lower PCB residues in contaminated Mercenaria mercenaria to less than 2 ppM. Contaminated M. mercenaria were transferred on November 20, 1978 from New Bedford Harbor, New BBedford, MA to a nearby area with no measurable amounts of PCBs in the sediments. Total PCB contents of specimens from the original habitat were 3.9 to 4.8 mg/g (wet tissue). With one exception, subsequent residue data fit in a curve characterized by a slow decrease from 2.5 mg/kg to 1.6 mg/kg from December 1978 to May 1979. A sharp decrease from 1.6 mg/kg to 0.4 mg/kg occurred in May and June 1979, whereas the reduction from June 1979 to September 1979 was minimal.

27807 **Trace element levels in tissues from cattle fed a sewage sludge amended diet.** Boyer, K.W.; Jones, J.W.; Linscott, D.; Wright, S.K.; Stroube, W.; Cunningham, W. (Food and Drug Administration, Washington, DC). pp 449-456 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Levels of 20 elements (Al, Ca, Cd, Cl, Co, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, P, Pb, Rb, Sb, Se, V and Zn) are reported for kidney, liver, muscle, spleen and brain sample tissues taken from 2 groups of 6 steers each from a feeding study conducted at Colorado State University. The control group was fed a normal feedlot cattle ration and the test group was fed the same ration amended with 12% air-dried municipal sewage sludge. Elemental levels are also reported for the control and test diets, control and test feces, and the sewage sludge added to the diet. All samples were analyzed by inductively coupled plasma emission spectroscopy and neutron activation analysis. Brief descriptions of analytical methodologies used are included. The levels of all metals determined were elevated in the test diet (as high as 19-fold for Cd) compared to the control diet. The levels of Pb and Cd in kidney and of Pb, Cd and Cu in liver from the test animals were high enough to be of concern for human consumption of these tissues on a regular basis. No levels of any other elements found in any of the control or test animal tissues were high enough to be of concern for human consumption.

27808 **Chemistry and plants of streams and rivers with elevated zinc.** Whitton, B.A.; Diaz, B.M. (Univ. of Durham, England). pp 457-463 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Surveys of water chemistry, sediment composition, species of photosynthetic plant and their elemental composition have been placed on computer file. Most of the data for streams and smaller rivers have been collected from particular 10-m lengths (reaches). Records have been collected from waters showing a wide range of chemistries, but special emphasis has been placed on the study of zinc. The paper summarizes the data and illustrates how they can be used. The number of plant species at a reach decreases with increasing level of Zn, but the relative contribution of each phylum remains rather similar. For example, if the occurrence of species in the environmental range $> 10 \leqq 100$ mg l^{-1} Zn is compared with their occurrence in the range $\leqq 0.1$ mg l^{-1} Zn, there are 20% blue-green algae, 23% green algae (Chlorophyta), 15% Conjugatophyta and 24% bryophytes.

27809 **Relative biological toxicity effectiveness of chemicals toward microorganisms.** Kwasniewska, K.; Liu, D.; Strachan, W.M.J. (National Water Research Inst., Burlington, Ontario). pp 470-477 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

A number of compounds of environmental concern were examined for their toxicity by using turbidity measurement, oxygen uptake rate, microscopic examination and taxonomical analysis. The toxicants were tested at levels of concentration between 5 to 1000 ppM using mixed bacterial cultures. The following chemicals were tested in the presented studies: pentachlorophenol (PCP), 3-trifluoromethyl-4 nitrophenol (TFM), 2,6-dichlorophenol (DCP), p-nitrophenol, o-chlorophenol (CP), phenol, aniline, n-dodecyl benzene sulfonate (Marlon), sodium tetrapropylene benzene sulfonate (TPBS), 2,4-dichlorophenoxy acetic acid (2,4-D) and fenitrothion (FNT).

27810 **Heavy metals in garden soil and vegetables in Washington, DC.** Preer, J.R. (Univ. of the District of Columbia, Washington); Sekhon, H.S.; Weeks, J. Jr.; Stephens, B.R. pp 516-521 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

Lead, cadmium, zinc and copper have been measured in leafy vegetables and garden soils in Washington, DC. In a sample of 70 gardens, elevated soil Pb was observed with greater frequency than Cd, Zn or Cu. Metal levels in soil showed positive correlations with one another. Soil Pb was found to vary inversely with distance from the city center. Soil Pb of home gardens sampled showed a small but significant elevation over that of community gardens; Pb in these samples showed very little elevation. Lead in leafy vegetables correlated with soil Pb and with a parameter designed to measure traffic exposure. Cadmium was elevated in leafy vegetables from plots in 3 community gardens with low soil pH and/or elevated soil Cd. In leafy vegetables Cd varied inversely with soil pH.

27811 **Uptake of sodium into vegetables cooked in water with elevated levels of sodium.** Rowan, C.A.; Calabrese, E.J. (Univ. of Massachusetts, Amherst). pp 529-532 of Trace substances in environmental health. XIV. Hemphill, D.D. (ed.). Columbia, MO; University of Missouri (1980).

From 14. annual conference on trace substances in environmental health; Columbia, MO, USA (2 Jun 1980).

This study compared the sodium levels of 3 fresh low sodium vegetables (cabbage, squash, potato) cooked in water containing no Na with the same vegetables cooked in water with Na of 100 and 250 mg/l, and 100 mg/l with one teaspoon of salt according to specified cooking practices. Analyses were conducted by flame atomic absorption spectrophotometry. The results indicate that for each vegetable there was a progressively greater Na retention at each greater level of Na in the cooking water. This study is of potential significance for persons following low Na diets and may initiate interest in the scientific community to measure the effect of drinking water and cooking practices on the total exposure to heavy metals.

27812 **Health implications of new energy technologies.** Rom, W.N.; Archer, V.E. (eds.). Ann Arbor, MI; Ann Arbor Science Publishers, Inc. (1980). 806p. (CONF-790447—).

From Health implications of the new energy technologies; Park City, UT, USA (4 Apr 1979).

Separate abstracts were prepared for 50 of the 55 chapters in this conference report held in Park City, Utah, April 4-7, 1979. The 5 chapters not abstracted here have been previously input to the data base. (KRM)

27813 **Biological activity of effluents from fluidized bed combustion of high-sulfur coal.** Kubitschek, H.E.; Haugen, D.A. (Argonne National Lab., IL). pp 381-394 of Health implications of new energy technologies. Rom, W.N.; Archer, V.E. (eds.). Ann Arbor, MI; Ann Arbor Science Publishers, Inc. (1980).

From Health implications of the new energy technologies; Park City, UT, USA (4 Apr 1979).

Coal combustion technologies produce effluents which contain multiple mutagens and carcinogens. The mutagenic compounds

in the particulate effluent from FBC's are stable over long periods of time and act directly upon cells without requiring activation with microsomal enzymes. Several broad classes of mutaganic organic compounds in extracts from the particulate effluent from small experimental FBC's have been identified by the use of silica gel chromatography. The mutagenic classes include 4- to 6-ring aromatic and highly polar compounds. However, no single class of mutagenic compounds was found to be much more mutagenic than the other classes. Hydrocarbon-containing condensate collected downstream of the final particulate filter on the PFBC was found to have a higher specific activity than the particulate effluent, presumably because of the large fraction of inert inorganic material in the latter. However, when the two materials were compared on the basis of equal weight of organic material, the biological activities are approximately equal. In addition to problems of sampling, analyzing, and comparing effluents from coal technologies by use of the Ames Salmonella assay, there are intrinsic difficulties that may be expected to occur with other tests as well. The use of mutagens, such as benzo(a)pyrene or nitrofluorene, as standards of reference does little to reduce the effort required for reasonable accuracy, although such standards do make possible the comparison of results obtained in different laboratories.

27814 Morphologic effects of intratracheally administered oil shale in rats. Renne, R.A.; Lund, J.E.; McDonald, K.E.; Smith, L.G. (Batelle Pacific Northwest Lab., Richland, WA). pp 501-514 of Health implications of new energy technologies. Rom, W.N.; Archer, V.E. (eds.). Ann Arbor, MI; Ann Arbor Science Publishers, Inc. (1980).

From Health implications of the new energy technologies; Park City, UT, USA (4 Apr 1979).

Because most oil shale contains a significant amount of silica, a comparative study of the response of rats over an eight-month period to intratracheally instilled raw shale, spent shale, and quartz was undertaken. In addition, a long-term (two-year) study in rats on the effect of raw or spent shale in multiple exposures over an eight-month period was conducted. The respiratory tract was examined histologically to detect biological effects. A relatively mild degree of fibrosis was observed in raw or spent shale-exposed rats throughout the two-year study. However, the data have not demonstrated a carcinogenic effect of respiratory exposure to large volumes of raw or spent shale. (KRM)

27815 Influence of pH and length of post-treatment incubation on bleomycin-induced DNA damage. Moore, C.W.; Vossler, D.A. (Univ. of Rochester, NY). *Biochimica et Biophysica Acta ;* **610**: 425-429(1980).

The dependence of the extent of DNA damage by anticancer bleomycin on pH and length of post-treatment incubation was studied in yeast. Bleomycin was always removed from cells after 20-min exposures, and cells were washed prior to incubation in non-nutrient buffer. Following exposures of late stationary-phase cells to the very low dose of only 3 μg/ml, 1.5 h incubation in non-nutrient buffer, pH 5, had hardly any effect on profiles derived from alkaline sucrose gradient sedimentation of nucleic acids released from spheroplasts. In contrast, after incubation of cells for 1.5 h in buffer, pH 7, DNA was all low molecular weight. Thus, even after extensive washing of cells, pH strongly influences the drug's action on DNA. At pH 5, washed cells were increasingly susceptible to DNA damage up to 26 h in non-nutrient buffer.

27816 Changes in thyroid function after short-term ozone exposure in rats. Clemons, G.K.; Garcia, J.F. (Univ. of California, Berkeley). Contract W-7405-ENG-48. *Journal of Environmental Pathology and Toxicology ;* **4**: 359-369(1980).

Exposure of male rats to ozone for 24 h at 1 ppM caused a profound depression of the pituitary-thyroid axis as indicated by a highly significant reduction of circulating thyrotropin hormone (TSH), thyroid hormones (T4 and T3), and protein-bound iodine (PBI). The metabolic clearance of TSH was not altered during ozone exposure and the high TSH levels seen in thyroidectomized rats were also not affected. Circulating prolactin (PRL) levels were significantly elevated after exposure. Pituitary TSH and PRL content was considerably increased in ozone-exposed rats; however, only TSH was released significantly above control values in vitro. Thyroid weight was also significantly increased after exposure. The results suggest that the depression of the pituitary-thyroid axis may be an adaptive mechanism during ozone exposure by reducing hypothalamic stimulation via thyrotropin releasing hormone (TRH) and at the same time lifting the hypothalamic catecholamine inhibition on PRL release. Both may be necessary alterations in order to develop tolerance during ozone exposure.

27817 Studies with chlorinated dibenzo-p-dioxins, polybrominated biphenyls, and polychlorinated biphenyls in a two-stage system of mouse skin tumorigenesis: potent anticarcinogenic effects. Berry, D.L. (Oak Ridge National Lab., TN); Slaga, T.J.; DiGiovanni, J.; Juchau, M.R. Contract W-7405-ENG-26. *Annals of the New York Academy of Sciences ;* **320**: 405-414(May 1979).

The chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans are among the most potent teratogens and toxins that are found as environmental contaminants. The polychlorinated biphenyls and polybrominated biphenyls are not nearly as toxic as the dioxins, but they are environmentally more prevalent than the dioxins. Both classes of compounds are inducers of cytochrome P_{450}-mediated microsomal monooxygenases and of aminolevulinic acid synthetase. The dioxins induce aryl hydrocarbon hydroxylase, the enzyme system responsible for converting polycyclic aromatic hydrocarbons to active and inactive metabolites. PCB's and PBB's induce the monooxygenase system with properties similar to both phenobarbital and 3-MC. Timing is important in the application of PCB to the diets of laboratory animals. Treatment with PCB's prior to the administration of carcinogen results in reduction of tumor response whereas treatment subsequent to application of the carcinogen results in enhancement of the tumorogenic response. The two-stage system of mouse skin tumorigenesis allows one to evaluate critically the initiation and promotion phases of carcinogenesis individually. (DLS)

27818 Health effects of halogenated aromatic hydrocarbons. Nicholson, W.J.; Moore, J.A. (eds.). New York, NY; New York Academy of Sciences (1979). 740p.

Proceedings from the international conference, Health Effects of Halogenated Aromatic Hydrocarbons, and several related workshops are documented and included is an index of contributors. General categories of discussion include: production, chemistry and distribution; animal toxicity and metabolism; general human health effects; neurologic and behavioral abnormalities; carcinogenicity; immunologic abnormalities; and a case study from the Hudson River. Also contained are papers from two workshops, Body Clearance of Halogenated Hydrocarbons and Immunologic Alterations Resulting from Exposure to Environmental Chemicals. A separate abstract was prepared for 1 of the papers in the proceedings. (DLS)

27819 Induction of renal cancers in rats by intrarenal injection of nickel subsulfide. Sunderman, F.W. Jr.; Maenza, R.M.; Hopfer, S.M.; Mitchell, J.M.; Allpass, P.R.; Damjanov, I. (Univ. of Connecticut, Farmington). Contract E(11-1)-3140. *Journal of Environmental Pathology and Toxicology ;* **2**: 1511-1527(1979).

The carcinogenicity of nickel subsulfide (αNi_3S_2) was studied following intrarenal (i.r.) injection in rats. Within 100 weeks after i.r. injection of 5 mg of αNi_3S_2, renal cancers were found in 64% of Wistar-Lewis rats, 50% of NIH Black rats, 28% of Fischer rats and 0% of Long-Evans rats. These findings demonstrate significant differences in susceptibilities of the four rat strains to αNi_3S_2-induction of renal cancers. No renal cancers were found in male Fischer rats that received i.r. injection of αNi_3S_2-induction of renal cancers. No renal cancers were found in male Fischer rats that received i.r. injection of αNi_3S_2 in dosages of 0.6, 1.2 or 2.5 mg. In male Fischer rats that received i.r. injection of αNi_3S_2 in dosages of 5 or 10 mg, the incidences of renal cancers were 28% and 75%, respectively. These findings demonstrate a dose response relationship for αNi_3S_2-induction of renal cancers. In male Fischer rats that received i.r. injection of 10 mg of αNi_3S_2 combined with 6.9 mg of Mn dust, the incidence of renal cancers was 32%, which differed significantly from the corresponding incidences of 75% and 0% in rats that received i.r. injections of only αNi_3S_2 (10 mg) or Mn dust (6.9 mg). These findings demonstrate that αNi_3S_2-induction of renal cancers is inhibited by simultaneous administration of manganese dust. The 54 renal tumors that were found in this study

were all malignant, and distant metastases were present in 69% of tumor-bearing rats. The histogenesis of αNi_3S_2-induced renal tumors from epithelial or mesenchymal progenitor cells could not be definitely established.

5604 Other Environmental Pollutant Effects

27820 Biological effects of magnetic fields: a progress report. Frazier, M.E. (Batelle Pacific Northwest Lab., Richland, WA). pp 679-685 of Health implications of new energy technologies. Rom, W.N.; Archer, V.E. (eds.). Ann Arbor, MI; Ann Arbor Science Publishers, Inc. (1980).

From Health implications of the new energy technologies; Park City, UT, USA (4 Apr 1979).

The consistently observed effect of magnetic fields in animals is a decreased fertility in trout eggs; the consistently observed effects in cell cultures include increased plating efficiency for cells exposed during growth, a decreased plating efficiency of cells chronically exposed and removed from the field; and a cooperative effect between a chemical mutagen (EMS) and the magnetic field. That is, there was a decreased survival of cells and an increase in mutagenicity when the two exposures occurred simultaneously.

27821 Statistical analysis of root growth rate determination. Cox, C.; Davis, H.T.; Miller, M.W.; Robertson, D. (Univ. of Rochester, NY). *Environmental and Experimental Botany ;* **20**: 389-396(1980).

Experiments in which a number of factors may influence a response require careful analysis. Typically, such factors include a treatment condition, whose effects are of primary interest, and a number of secondary variables, whose influence cannot be controlled in the design of the experiment. The analysis of variance can be used to analyze such complex experiments. Data on the growth rates of pea roots exposed to 60 Hz electric fields are used to illustrate this statistical technique. Also included is a series of related plots, which clearly reveal the structure in the data.

58 GEOSCIENCES

5801 Geology And Hydrology

REFER ALSO TO CITATION(S) 26846, 26903, 26909, 26926

27822 Terrestrial age dating of antarctic meteorites. Evans, J.C. (Battelle Northwest Lab., Richland, WA); Reeves, J.H.; Rancitelli, L.A. *Antarctic Journal of the United States ;* **15**: No. 5, 53-54(1980).

During the last three antarctic field seasons, US and Japanese teams have collected several thousand meteorites. The terrestrial age of these objects is of interest because such knowledge enables the setting of lower bounds on the lower age of the ice sheet, provides information about ice movement, and aids understanding of the accumulation mechanism of the meteorites. Terrestrial ages can be established by measuring the decay of radioactive species produced by bombardment of cosmic rays while the objects are in space. After entering the Earth's atmosphere the meteorites essentially are completely shielded from cosmic rays. The radioactive products that exist at saturation values in space then decay exponentially toward zero activity. By the end of 1980, data will be established on 150 to 200 selected samples. With that large a data base we should have a fairly clear picture of the terrestrial age distribution of antarctic meteorites.

27823 Post-oligocene tectonic rotation of the Oregon western Cascade Range and the Klamath Mountains. Magill, J.; Cox, A. (Stanford Univ., CA). Contract FC07-79ID12044. *Geology ;* **9**: No. 3, 127-131(Mar 1981).

Paleomagnetic data indicate that the Western Cascade Range from northern California to central Washington has undergone about 27° of clockwise rotation since 25 m.y. B.P. All the available regional paleomagnetic data fit a two-phase rotation model, the first phase being an Eocene rotation that accompanied the accretion of the Oregon Coast Range to the continent and the second phase being a rotation associated with post-early Miocene extension in the Basin and Range province.

27824 Tectonic stress trajectory map of Alaska using information from volcanoes and faults. Nakamura, K. (Univ. of Tokyo, Japan); Plafker, G.; Jacob, K.H.; Davies, J.N. *Tokyo Daigaku Jishin Kenkyusho Iho ;* **55**: 89-100(1980).

A preliminary tectonic stress trajectory map for the Alaska region is compiled from 44 directions of maximum horizontal compression obtained for published data about post-Miocene volcanoes and late Quaternary faults. The pattern of the trajectory lines gives an averaged picture of the tectonic stress field during the late Quaternary. The pattern correlates with relative motion between the Pacific and North America plates, as judged by parallelism between the trajectory lines and direction of convergence of the two plates. Within a zone several hundred kilometers wide along the plate boundary, the mapped trajectories coincide with P-axes in a three-dimensional stress system. In the eastern Bering sea and interior Alaska, P-axes appear to be vertical and the mapped trajectories probably represent the B or axes of intermediate stress (σ_2). Thus, the compressive stress in the arc area is replaced in the back-arc region by tensional stresses which are probably caused by a large-scale, deep-seated stress source. Despite this tensional stress field in the back-arc region no coherent spreading is observed there behind the Alaska Aleutian arc system. It is suggested that back-arc regions are potentially extensional but that the formation of back-arc basins depends on a mechanism other than subduction near the trench so that the space of an extending back-arc region is appropriately filled.

27825 Evolution of the central Rio Grande rift, New Mexico: new potassium-argon ages. Baldridge, W.S. (Los Alamos Scientific Lab., NM); Damon, P.E.; Shafiqullah, M.; Bridwell, R.J. *Earth and Planetary Science Letters ;* **51**: 309-321(1980).

New K-Ar age determinations on mid-Oligocene to Pleistocene volcanic and shallow intrusive rocks from the central Rio Grande rift permit a more detailed understanding of the tectonic and magmatic history of the rift. Initial extension in the region of the central rift may have begun prior to 27 m.y. ago. By 25 m.y. ago broad basins existed and were filling with volcaniclastic sediments derived mainly from volcanic centers in the San Juan and Questa areas. Continued tectonic activity narrowed these basins by 21-19 m.y. ago, indicated in the Santa Fe area by tilting and faulting that immediately postdate 20-m.y.-old latite. Uplift of the Sangre de Cristo, Sandia, and Nacimiento Mountains shed clastic debris of the Santa Fe Group into these basins. Early rift magmatism is characterized by an overlap of mid-Tertiary intermediate intrusive and extrusive activity, extending to 20 m.y. ago, with mafic and ultramafic volcanism, ranging from 25 to 19 m.y. Both volcanism and tectonic activity were minimal during the middle Miocene. About 13 m.y. ago renewed volcanic activity began. Tectonism commenced in the late Miocene, resulting in the present, narrow grabens. The term Rio Grande rift should be restricted to these grabens formed during post-mid-Miocene deformation. Widespread eruption of tholeiitic and alkali olivine basalts occurred 3-2 m.y. ago. The Rio Grande drainage system was integrated 4.5-3 m.y. ago, leading to the present erosional regime. These intervals of deformation and magmatism correspond generally with a similar sequence of events in the Basin and Range province south of the Colorado Plateau. This similarity indicates that the Rio Grande rift is not a unique structure in the southwestern US, and must be related to the larger context of the entire Basin and Range province.

5803 Mineralogy, Petrology, And Rock Mechanics

REFER ALSO TO CITATION(S) 26832, 26904, 26905

27826 (LBL—11953) Example of fracture characterization in granitic rock. Thorpe, R.K. (Lawrence Berkeley Lab., CA (USA)). Mar 1981. Contract W-7405-ENG-48. 9p. (CONF-810624—8). NTIS, PC A02/MF A01. Order Number DE81023244.

From 22. US symposium on rock mechanics; Cambridge, MA, USA (29 Jun 1981).

A detailed study of geologic discontinuities for an underground heater test in highly fractured granitic rock is reported. Several prominent shear fractures were delineated within a 6 x 30 x 15 m rock mass by correlating surface mapping and borehole frac-

ture logs. Oblique-reverse faulting is suspected on at least one of the surfaces, and its inferred borehole intercepts appear to be collinear in the direction of slickensiding observed in the field. Four distinct joint sets were identified, one of which coincides with the shear fractures. Another lies nearly horizontal, and two others are steeply inclined and orthogonal. Fracture lengths and spacings for the four joint sets are represented by lognormal probability distributions.

5804 Geochemistry

27827 (BNL—29656) Some geochemical characteristics of the Pachuca Obsidian Region: a strategy for interpreting artifact groups. Neivens, M.; Harbottle, G.; Kimberlin, J. (Brookhaven National Lab., Upton, NY (USA); Chevron Research Co., Richmond, CA (USA)). Jan 1981. Contract AC02-76CH00016. 21p. (CONF-810147—1). NTIS, PC A02/MF A01. Order Number DE81025097.

From Simposio La Obsidiana en Mesoamerica; Pachuca, Mexico (26 Jan 1981).

Obsidian research has revealed geochemical anomalies. Neutron activation analysis was used to analyze the samples. Correlations were made between element pairs (Sc and Fe, Ba and Co). Tests were made for homogeneity. 5 figures. (DLC)

27828 ^{230}Th, ^{226}Ra and ^{222}Rn in abyssal sediments. Kadko, D. (Columbia Univ., Palisades, NY). *Earth and Planetary Science Letters ;* **49**: 360-380(1980).

A model that predicts the flux of ^{222}Rn out of deep-sea sediment is presented. The radon is ultimately generated by ^{230}Th which is stripped from the overlying water into the sediment. Data from many authors are compared with the model predictions. It is shown that the continental contribution of ionium is not significant, and that at low sedimentation rates, biological mixing and erosional processes stronly affect the surface concentration of the ionium. Two cores from areas of slow sediment accumulation, one from a manganese nodule region of the central Pacific and one from the Rio Grande Rise in the Atlantic were analyzed at closely spaced intervals for ^{230}Th, ^{226}Ra, and ^{210}Pb. The Pacific core displayed evidence of biological mixing down to 12 cm and had a sedimentation rate of only 0.04 cm/ky. The Atlantic core seemed to be mixed to 8 cm and had a sedimentation rate of 0.07 cm/ky. Both cores had less total excess ^{230}Th than predicted. Radium sediment profiles are generated from the ^{230}Th model. Adsorbed, dissolved, and solid-phase radium is considered. According to the model, diffusional losses of radium are especially important at low sedimentation rates. Any particulate, or excess radium input is ignored in this model. The model fits the two analyzed cores if the fraction of total radium available for adsorption-desorption is about 0.5 to 0.7, and if K, the distribution coefficient, is about 1000. Finally, the flux of radon out of the sediments is derived from the model-generated radium profiles. It is shown that the resulting standing crop of ^{222}Rn in the overlying water may be considered as an added constraint in budgeting ^{230}Th and ^{226}Ra in deep-sea sediments.

27829 Differences between barites of marine and continental origins. Goldberg, E.D. (Scripps Institution of Oceanograpy, La Jolla, CA); Somayajulu, B.L.K.; Galloway, J.; Kaplan, I.R.; Faure, G. *Geochimica et Cosmochimica Acta ;* **33**: 287-289(1969).

Uranium, thorium and strontium concentrations and strontium and sulfur isotopic ratios have been determined on a group of barites. The isotopic analyses and the uranium and thorium concentrations appear to be especially diagnostic in distinguishing between marine and continental origins of the mineral. These critiques have been applied to some barites recovered off the California coast.

5805 Oceanography

REFER ALSO TO CITATION(S) 26910, 26915, 26916, 26917, 26918, 26919, 26920, 27828, 27829

64 PHYSICS RESEARCH

6401 Astrophysics And Cosmology

REFER ALSO TO CITATION(S) 27582, 27602, 27604, 27607, 27609

27830 (LA-UR—81-1875) Cosmic-ray-produced stable nuclides: various production rates and their implications. Reedy, R.C. (Los Alamos National Lab., NM (USA)). 15 Jun 1981. Contract W-7405-ENG-36. 38p. (CONF-810378—2). NTIS, PC A03/MF A01. Order Number DE81025351.

From 12. lunar and planetary science conference; Houston, TX, USA (16 Mar 1981).

The rates for a number of reactions producing certain stable nuclides, such as ^{3}He and ^{4}He, and fission in the moon are calculated for galactic-cosmic-ray particles and for solar protons. Solar-proton-induced reactions with bromine usually are not an important source of cosmogenic Kr isotopes. The ^{130}Ba(n,p) reaction cannot account for the undercalculation of ^{130}Xe production rates. Calculated production rates of ^{15}N, ^{13}C, and ^{2}H agree fairly well with rates inferred from measured excesses of these isotopes in samples with long exposure ages. Cosmic-ray-induced fission of U and Th can produce significant amounts of fission tracks and of ^{86}Kr, ^{134}Xe, and ^{136}Xe, especially in samples with long exposures to cosmic-ray particles.

27831 (LA-UR—81-1909) Envelope ionization mechanisms and BW Vulpeculae. Cox, A.N.; Hodson, S.W.; Clancy, S.P. (Los Alamos Scientific Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 7p. (CONF-8106112—3). NTIS, PC A02/MF A01. Order Number DE81025368.

From Workshop on pulsating B stars; Nice, France (1 Jun 1981).

Envelope ionization variations during the pulsations of β Cephei variables are known to be insufficient to drive pulsations in these stars in the presence of strong deeper radiative damping. If a model can be found with smaller than normal damping, or larger than normal helium ionization driving, then any intermittent core region driving will be more effective and will drive the pulsations to a larger than normal amplitude. If the net damping is so small then the decay of these pulsations will also be slower than normal. It is suggested that increased envelope helium, which might occur by accretion of matter from an involved companion, or as just self homogenization, gives some helium ionization driving and a smaller decay rate. Perhaps BW Vulpeculae has such helium enriched surface layers which explain its unique large amplitude, even though the helium lines do appear normal.

27832 Exploration of acoustic radiation produced by cosmic ray particles in water. Yin-lin, J.; An-xiang, H.; Duan-bao, C.; Rong-ting, Z.; Jian-ning, S.; Zhi-guang, L. pp 109-114 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

It has been proved in accelerator experiments that charged particle beams passing through solid or liquid medium can produce some detectable acoustic signals. A lot of experiments have been done in liquid medium for studying the mechanism of the sound production, the nature of sound wave and the lower limit of the detectable energy. In recent years, cosmic ray physicists have paid much attention to this research project. DUMAND-project is trying to build a large detector whose mass is about 10^{9} to 10^{11} tons at the bottom of ocean where the depth is 5 Km. Cascade showers produced by high energy muons and neutrinos will be detected by using acoustic effect and Cerenkov effect. In this way, ultrahigh energy interactions and neutrino astronomy will be investigated. If this can be done, it will be an important work to the understanding of ultrahigh energy physics, cosmic ray physics and neutrino astronomy. Two preliminary measurements from different water reservoirs are presented.

27833 Air shower detection systems for DUMAND: workshop section IIIc. Part I. An atmospheric shower detector near DUMAND. Elbert, J. (Univ. of Utah, Salt Lake City). pp 203-211 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

It appears to be feasible to construct an onshore, remote air shower detector to measure shower energies in coincidence with underwater muon events in DUMAND. Like the Utah Fly's-Eye, the system would respond to air scintillation. The system would have the ability to measure air shower energies and select those showers which were probably due to primary protons. For a DUMAND site 13 km offshore, it is estimated that a shower detection threshold of $\sim 10^{16}$ eV would be achieved with an event rate of $\sim 10^4$/year. A description of the detector system is given, along with the values of relevant parameters.

27834 Air shower detection systems for DUMAND: workshop section IIIc. Part 2. Low energy muon array at shallow depth over DUMAND. Grieder, P.K.F. (Universitat Bern, Switzerland). pp 212-218 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

Construction of a muon array consisting of large water Cerenkov detectors submerged 50 m below the ocean surface, located above the DUMAND system, is proposed and discussed. Details of the layout are presented and estimated counting rates for showers of different sizes are given.

27835 Air shower investigations with DUMAND M. Grieder, P.K.F. (Univ. of Bern, Switzerland); Allkofer, O.C. pp 229-241 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

The construction of an air shower detection system to be operated in conjunction with the DUMAND detector is suggested, to determine the energy of the showers that are associated with the high energy muons recorded by DUMAND. Apart from the possibility to use a fly's eye type detector installed on shore, construction of a low energy muon array (E/sub μ/ $\geqq$ 10 GeV), located at a depth of approximately 50 m below the ocean surface is proposed. The scope of experiments that would become feasible in this case, covering topics in high energy and cosmic ray physics as well as astrophysics, are outlined and numerous graphs are presented.

27836 Physics with DUMAND M. Allkofer, O.C. (Univ. of Kiel, Germany). pp 267-275 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

A short review is given about a cosmic ray physics program which could principally be a basis for a DUMAND-System of about 10^7 t.

27837 Interactions of ultra high energy cosmic ray muons. Grupen, C. (Siegen Univ., Germany). pp 297-305 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

The interactions of energetic cosmic ray muons in water at the DUMAND M depth (2 to 3 km) are calculated. For high muon energies and high energy transfers muon bremsstrahlung and inelastic scattering of muons on nucleons are the dominant processes. Rate calculations for 10 TeV and 100 TeV muons on a target of 500 m water are performed. The center of mass energies available are below those of the proposed e-p facility HERA for E/sub μ/ $<$ 50 TeV. Thus, for tests of quantum electrodynamics or the search for new processes only muon energies in excess of 50 TeV are useful. To also test neutrino interactions with DUMAND M it is proposed to measure the ratio of stopping to penetrating muons by a prompt-delayed coincidence on some of the photomultiplier modules. This ratio might give a clue on possible extra sources of muons and neutrinos.

27838 Muon spectrum and charge ratio up to 7 TeV. Allkofer, O.C. (Kiel Univ., Germany); Bleichert, B.M.; Boehm, E.; Carstensen, K.; Dau, W.D.; Jokisch, H.; Klemke, G.; Uhr, R.C. pp 306-314 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

The DEIS-spectrometer measured the nearly horizontal muon spectrum and charge ratio at sea level up to 7 TeV. The apparatus recorded 13.10^6 triggers during an effective time of 6430 hours. An extensive analysis of all data has been performed. Final results are presented.

27839 Searches for narrow angle anisotropies in the primary energy range 0.1 to 10 TeV. Allkofer, O.C. (Univ. of Tel Aviv, Israel); Binder, O.H.; Bleichert, B.M.; Carstensen, K.; Dau, W.D.; Jokisch, H.; Klemke, G.; Uhr, R.C.; Bella, G.; Oren, Y. pp 315-325 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

The arrival direction and energy of individual muons has been measured with the DEIS spectrometer at Tel Aviv. After applying geomagnetic corrections, the muons were sorted into four groups according to their energy at production. Each group was investigated for narrow angle anisotropies. The general result is directional isotropy, but three peculiar deviations (two positives, one negative) have been found on a confidence level of 1 to 3%.

27840 Energy loss of high energy muons due to photonuclear interactions. Constandt, W.; Dau, W.C.; Jokisch, H. (Univ. of Kiel, Germany). pp 326-345 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

The energy loss of high energy muons due to photonuclear interactions has been calculated according to Drell-Walecka and GVDM expressions using accelerator data. The inelastic structure functions have been used to extrapolate the cross-section to the 100 TeV region. The total cross-section, the transferred energy distribution and the energy loss parameter b/sub N/ are enumerated for applications with cosmic ray muons.

27841 Effects of oscillations on neutrinos generated by cosmic rays in the earth's atmosphere. Silberberg, R.; Shapiro, M.M. (Naval Research Lab., Washington, DC). pp 59-65 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

Recent indications of neutrino oscillations would, if confirmed, have certain consequences for the neutrinos generated by cosmic rays in the earth's atmosphere. The intensity of electron neutrinos produced by cosmic-ray interactions in the atmosphere would be considerably enhanced with respect to that of muon neutrinos. Above 100 GeV, this ratio of the two fluxes R = J(ν/sub e/ + anti ν/sub e/)/J(ν/sub μ/ + anti ν/sub μ/) would be increased by an order of magnitude, reaching unity for the case of maximal mixing. This enhancement is pronounced only for neutrinos that have penetrated through the earth (i.e., upward moving neutrinos) up to energies near 10^4 GeV. It is suppressed at higher energies owing to the relativistic dilation of the oscillation length, which then exceeds the characteristic length for phase change between ν/sub e/ and ν/sub μ/ in matter, as well as the neutrino flight path through the earth. For downward moving neutrinos, however, with their shorter flight paths, the enhancement would already be suppressed at energies $\cong$ 10 GeV. The enhanced value of the ratio R would increase the background against which proton decay experiments must work.

27842 Note on effects of neutrino oscillations on observability of neutrinos from extragalactic gravitational collapse. Silberberg, R.; Shapiro, M.M. (Naval Research Lab., Washington, DC). pp 66-67 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

The search for neutrinos from the gravitational collapse of a star to a neutron star is hampered by two difficulties: for events within our galaxy, the problem is the infrequency of occurrence - possibly once in 20 years; for extragalactic events, the required detector size and expense present a limitation.

27843 Neutrinos and cosmology. Schramm, D.N. (Univ. of Chicago, IL). pp 68-76 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

It is shown that the cosmological density implied from the dynamics of clusters of galaxies is greater than the upper limit on the density of matter in baryons from big band nucleosynthesis if the primordial helium abundance, Y, is $\leqq$ 0.25. If Y is $\leqq$ 0.23 then even the density implied from the dynamics of binaries and small groups of galaxies cannot be in baryons. The solution to these problems comes if neutrinos have a small rest mass. For 3 eV $\leqq$ m/sub ν/ $\leqq$ 10 eV, the neutrinos will be trapped on the scale of large clusters. For 10 eV $\leqq$ m/sub ν/ $\leqq$ 20 eV, they will be trapped on the scale of binaries and small groups. If neutrinos have a rest mass $\geqq$ 10 eV, then the limits on numbers of neutrinos types from big bang nucleosynthesis may be relaxed if it is shown that the density of baryon matter is much less than the density implied by binaries and small groups. If neutrinos have rest mass there is no serious conflict with big bang nucleosynthesis as long as Y is $\geqq$ 0.15.

27844 Cosmological limits on neutrino masses. Olive, K.A. (Univ. of Chicago, IL). pp 77-91 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

Limits relating stable neutrino interaction strengths and their masses are derived from the standard big bang model. For light neutrinos (m/sub ν/ $<$ 1 MeV), the upper limits range from 0.1 to 1.0 KeV depending on their interaction strength. For heavy stable neutrinos, m/sub ν/ $\geqq$ (G/sub F//G/sub SW/)^{0} ^{96}. An additional constraint is available if there exists a neutrino asymmetry comparable to the baryon asymmetry which implies m/sub ν/ $\leqq$ 2.0 TeV. A brief review of previous limits will also be discussed.

27845 Massive neutrinos and cosmological nucleosynthesis. Wasserman, I.; Shapiro, S.L.; Teukolsky, S.A. (Cornell Univ., Ithaca, NY). pp 92-102 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

It is shown that finite neutrino rest masses, m/sub ν/ $\sim$ 10 eV, would not alter primordial element abundances produced in the early Universe. Even though massive Dirac neutrinos could occupy up to twice as many spin states as massless neutrinos, weak interactions via the standard Weinberg-Salem-Glashow theory couplings never proceed sufficiently rapidly to produce a thermal population of positive helicity neutrinos.

27846 Solar neutrino experiments and a test for neutrino oscillations with radioactive sources. Cleveland, B.T.; Davis, R. Jr.; Rowley, J.K. (Brookhaven National Lab., Upton, NY). pp 103-114 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

The results of the Brookhaven solar neutrino experiment are given and compared to the most recent standard solar model calculations. The observations are about a factor of 4 below theoretical expectations. In view of the uncertainties involved in the theoretical models of the sun, the discrepancy is not considered to be evidence for neutrino oscillations. The status of the development of a gallium solar neutrino detector is described. Radiochemical neutrino detectors can be used to search for ν/sub e/ oscillations by using megacurie sources of monoenergetic neutrinos like ^{65}Zn. A quantitative evaluation of possible experiments using the Brookhaven chlorine solar neutrino detector and a gallium detector is given.

27847 Solar neutrino calculations: an update. Filippone, B.W. (Argonne National Lab., IL). pp 115-125 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

Preliminary calculations of the capture rate in two solar neutrino detectors - ^{37}Cl and ^{71}Ga - are reported. The assumptions needed to generate a standard solar model and the input required are discussed. New experimental and theoretical work on the input physics has increased the expected rates from previous values, but has also complicated the question of uncertainties in the prediction. Best estimates for the mean values and uncertainties are 7.1 +- 3 SNU for ^{37}Cl and 110 +- 10 SNU for ^{71}Ga. The possibility of observing neutrino oscillations in solar neutrino detectors is also discussed.

27848 Neutrino acceleration in supernova shocks. Ellison, D.; Kazanas, D. (NASA/Goddard Space Flight Center, Greenbelt, MD). pp 126-132 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

A Monte Carlo method is employed to study particle acceleration in the presence of shocks. The method is quite general and applicable to many astrophysical situations where shocks are present (i.e., the Earth's bow shock supernovae explosions and remnants, accretion onto compact objects). In particular, it is presently applied to study neutrino acceleration in supernova shocks. The neutrinos diffusing ahead of the shock (when the latter is at densities rho $\sim$ 10^{12} g cm^{-3}) can suffer energy gains (via a first-order Fermi acceleration mechanism) in a way quite similar to that considered for the acceleration of cosmic rays. The calculated emerging neutrino spectra show a power law dependence in agreement with theory. The excess energy thus imparted to neutrinos ($\sim$ 10^{50} to 10^{61} ergs) and the fact that it is distributed in a way increasing the average neutrino energy (by about a factor of 2) can make the neutrino detection of a supernova more likely. Furthermore, the neutrino spectra could potentially provide information about the physics of such shocks.

27849 Neutrinos and stellar collapse. Mazurek, T.J.; Cooperstein, J. (State Univ. of New York, Stony Brook). pp 142-157 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

Detailed calculations of the collapse of stellar cores and the attendant neutrino emission are presented. A critical summary of input physics required for such calculations is given. Present uncertainties in the latter and their potential effects are discussed. The influence of initial starting conditions for collapse is examined. It is found that the dynamic results are not overly sensitive to these, and the collapsed stellar structure is fairly unique. None of the calculations give mass ejection. The neutrino production processes are summarized. Detailed results on the prompt neutrino burst from collapse are given. It is found that electron-type neutrinos dominate the emission. However, for sufficiently high entropies from the shock the mu and tau neutrino emission can become appreciable. The well established features of stellar collapse are abstracted and the most pressing uncertainties in the dynamic calculations are examined. Finally, some comments are presented on possible effects of neutrino oscillations.

27850 Stellar implosion shocks and convective overturn. Lattimer, J.M.; Mazurek, T.J. (State Univ. of New York, Stony Brook). pp 158-167 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

Rayleigh-Taylor overturn in stellar collapse is examined from a thermodynamic point of view. At sufficiently high entropies leptonic gradients alone cannot give instability. The characteristics of shocks in the infalling envelope are examined. For shock strengths that are typical of current hydrodynamic calculations the entropy is sufficiently high to prevent large-scale overturn of the entire core. In addition, the condition of beta equilibrium at lower

densities and entropies insures a stable lepton gradient. Thus overturn powered solely by lepton gradients must be limited to the dense shocked mantle of the collapsed core. This suggests that lepton-overturn may not be dramatic.

27851 **High energy neutrino radiation of quasars and active galactic nuclei.** Berezinsky, V.S.; Ginzburg, V.L. (USSR Academy of Sciences, Moscow). pp 181-201 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

The nature of kerns in quasars and active galactic nuclei is still a controversy, though a massive black hole or a magnetoid (spinar) seem to be most plausible models of kern activity. It is difficult to distinguish between these models using only the observations of electromagnetic radiation. This paper suggests that high energy (E $\geqq$ 1 TeV) neutrinos can be a useful tool for solving the problem. The models of the structureless magnetoid and the black hole, surrounded by the dense gas shell or gas of x-ray photons, can be convincingly distinguished on the basis of the measured ratio of neutrino (E/sub ν/ $\geqq$ 1 TeV) to gamma-ray (E/sub γ/ $\geqq$ 70 MeV) fluxes. The existence of a cocooned black hole (i.e., a black hole surrounded by the gas shell rare inside and dense outside) and the possibility of particle acceleration in the cavity are discussed in the paper.

27852 **Neutrino dating of the galaxy formation epoch.** Berezinsky, V.S.; Ozernoy, L.M. (USSR Academy of Sciences, Moscow). pp 202-226 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

High energy neutrinos, owing to their penetration capability, can serve as a probe of the remote past of the Universe. The possible investigations include search of pregalactic objects and of the bright phase in course of galactic evolution, i.e., comparatively short time interval when luminosities of galaxies were very high. If the bright phase took place at redshifts as large as z $\geqq$ 10, the use of high-energy neutrinos is especially efficient because, in addition to an enhanced generation of ultra-high energy particles during the bright phase, there was a large density of relic photons; collisions of the former with the latter generate charged pions which produce pions which produce, in a chain of decays, neutrinos. The expected flux of neutrinos with energies E/sub ν/ > 10^{15} eV is evaluated for a case when the bright phase took place at z $\geqq$ 10. The accompanying gamma-ray radiation produced due to interactions of cosmic rays with gas (both in galaxies and in intergalactic space) and with relic radiation does not exceed the observed intensity of isotropic gamma-ray background. The expected intensity of neutrino fluxes is such that it can be measured by means of an acoustic version of the DUMAND array widely discussed at present. The paper also touches upon some topics of early evolution of galaxies and the acceleration of particles to ultra-high energies at the bright phase of galactic evolution.

27853 **DUMAND as a W^- factory.** Mikaelian, K.O. (Oklahoma State Univ., Stillwater); Zheleznykh, I.M. pp 227-239 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

Anti ν/sub e/e annihilations leading to several new final states are considered for anti ν/sub e/ energies between 10^{10} and 10^{18} EV interacting in the DUMAND detector. The rates are dominated by W^- production near its mass shell at E/sub anti ν/ = 7 x 10^{15} eV, which suggests viewing DUMAND as a W^- factory.

27854 **Heavy weak bosons, cosmic antimatter and DUMAND. I. Looking for heavier weak bosons with DUMAND.** Brown, R.W. (Case Western Reserve Univ., Cleveland, OH); Stecker, F.W. pp 240-247 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

A possibly unique opportunity afforded by a facility like that of DUMAND is discussed. A number of different theoretical developments indicate that one or more heavier weak bosons may coexist with the standard weak boson. If this is true, a broad program may be laid out for a search for the heavier W's via change in the total cross section for $\nu N \rightarrow \nu X$ due to the additional propagator, a concomitant search via the annihilation anti ν/sub e/e^-, and a subsequent search for significant antimatter in the universe involving the same annihilation, but being independent of possible neutrino oscillations. The program is likely to require detectors sensitive to higher energies, such as acoustic detectors.

27855 **Heavy weak bosons, cosmic antimatter and DUMAND. II. Looking for cosmic antimatter with DUMAND.** Stecker, F.W. (NASA Goodard Space Flight Center, Greenbelt, MD); Brown, R.W. pp 248-257 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

Various means for using high energy neutrino astronomy to directly test for the existence of cosmic antimatter on a significant cosmological scale are discussed. The best future hope for such a test may lie in studies of the ultrahigh energy diffuse neutrino background using acoustic detectors, particularly if high mass Glashow resonances exist. Point source studies are also discussed.

27856 **SS 433: a possible neutrino source.** Eichler, D. (Univ. of Maryland, College Park). pp 266-271 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

One currently popular model for SS 433 invokes an accreting neutron star in a binary system. The gravitational energy released by the accretion apparently goes mainly into the beams, rather than photons that escape the system. That the beams precess coherently suggests that they are guided by magnetic field lines that are grounded in the solid crust of the neutron star. The accreting matter, then, falls to the surface on one set of field lines, and the beams exit on another set. Assuming steady state, matter must flow across field lines. The pressure at which the solid crust liquefies is many orders of magnitude greater than the pressure at which magnetic field lines at the surface of the neutron star (B $\simeq$ 10^{12} gauss) would buckle, suggesting that the accreting matter crosses the field lines above the crust. The final beam velocity (v = 0.27 c) is close to the escape velocity from the neutron star surface, suggesting that the fluid switches field lines and lifts off near the surface.

27857 **Gamma ray astronomy at very high energies.** Grindlay, J.E. (Harvard-Smithsonian Center for Astrophysics, Cambridge, MA). pp 278-286 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

Gamma ray astronomy at very high energies ($\geqq$ 1 TeV) has yielded significant detections of several sources. These results are reviewed and their astrophysical significance as well as relevance to DUMAND is discussed. Several more recent results from both the high energy gamma ray domain as well as x-ray studies are also mentioned in this context. A proposed scheme for renewed observations of gamma ray sources at $\geqq$ 1 TeV with increased sensitivity is described as a worthwhile and yet simple complement to a DUMAND experiment.

27858 **Phenolic ethers in the organic polymer of the Murchison meteorite.** Hayatsu, R.; Winans, R.E.; Scott, R.G.; McBeth, R.L.; Moore, L.P.; Studier, M.H. (Argonne National Lab., IL). *Science ;* **207**: 1202-1204(14 Mar 1980).

Seven phenolic acids and many nonphenolic organic acids, including large amounts of meta-hydroxy (3-hydroxy) benzoic acid and 3-hydroxy-1,5-benzene-dicarboxylic acid, were obtained from the organic polymer of the Murchison C2 chondrite upon oxidation with alkaline cupric oxide. The phenolic acids apparently were de-

rived from phenolic ethers in the polymer, which in turn probably were formed from carbon monoxide and hydrogen by catalytic Fischer-Tropsch type reactions in the solar nebula. In contrast, terrestrial polymers such as lignin, humic acid, and coal yield mainly para-hydroxy (4-hydroxy) benzene derivatives by the same oxidation procedure. 1 figure, 1 table.

6403 Atomic, Molecular, And Chemical Physics

REFER ALSO TO CITATION(S) 27361, 27496, 27565, 27886

27859 (CONF-8009157—1) Transition probabilities for atoms. Kim, Y.K. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 11p. NTIS, PC A02/MF A01. Order Number DE81023878.

From Workshop on atomic physics at the national synchrotron light source; Upton, NY, USA (15 Sep 1980).

Current status of advanced theoretical methods for transition probabilities for atoms and ions is discussed. An experiment on the f values of the resonance transitions of the Kr and Xe isoelectronic sequences is suggested as a test for the theoretical methods.

27860 (DOE/ER/01198—1355) Studies in chemical physics through high-pressure luminescence. Drickamer, H.G. (Illinois Univ., Urbana (USA)). 1981. Contract AC02-76ER01198. 7p. (CONF-810827—1). NTIS, PC A02/MF A01. Order Number DE81025054.

From 8. AIRAPT conference and 19. EHPRG conference; Uppsala, Sweden (17 Aug 1981).

Energy transfer in chelates of Eu^{3+} with ligands (dibenzylmethane) was studied as a function of pressure. Rate of thermal dissipation of electronic excitation was correlated with viscosity and dielectric constant for indoles in a series of solvents, and with pressure for porphyrins. Effects of medium (dielectric constant, viscosity) on complexes were studied. Studies on 3-hydroxyflavone are also summarized. These studies show the power of high pressure luminescence as a tool in chemical physics. 11 figures. (DLC)

27861 (DOE/ER/04257—T2) I. Charge exchange collisions of highly stripped ions with atomic hydrogen. II. Development of a three-stage double tandem accelerator-decelerator system for low energy, highly stripped ions. Final report, March 1, 1977-May 30, 1981. Bayfield, J.E. (Pittsburgh Univ., PA (USA)). May 1981. Contract AS02-77ER04257. 7p. (COO—4257-4). NTIS, PC A02/MF A01. Order Number DE81025973.

The first measurements of charge exchange (electron transfer) in kiloelectron-volt-energy highly stripped boron, carbon, nitrogen and oxygen ion collisions with atoms have been extended to additional collision energies and charge values for the ions. A first accelerator-decelerator source of very highly stripped ions has been developed, and its usefulness in charge exchange studies established.

27862 (DOE/ER/10668—1) Investigation of the dynamics and threshold behavior of endothermic negative ion-neutral reactions. Annual progress report, July 15, 1980-July 14, 1981. Tiernan, T.O.; Wu, R.L.C. (Wright State Univ., Dayton, OH (USA)). 10 Jun 1981. Contract AC02-80ER10668. 27p. NTIS, PC A03/MF A01. Order Number DE81025570.

Modifications to a tandem mass spectrometer inlet system and ion source have been accomplished to facilitate introduction of solid organometallic compounds and oxidizing gases, which are potential sources of inorganic oxide molecular ions when these compounds are subjected to electron impact or microwave discharge. Experiments with a variety of organometallic compounds have resulted in successful production of PO^-, PO_2^-, and FeO_2^-, which were utilized as projectile ions in studies of collision-induced dissociation and endothermic charge transfer reactions. Energy thresholds measured in the latter experiments yielded the bond dissociation energies, $D_0°(O^- - P) = 5.6 +- 0.1$ eV and $D_0°(O^- - PO) = 7.4 +- 0.2$ eV, the first direct experimental determinations of these quantities. Used in conjunction with other thermochemical data these results lead to the determination of $\Delta H°_f(PO^-) = -1.0 +- 0.1$ eV; $\Delta H°_f(PO_2^-) = -6.4 +- 0.2$ eV; E.A. (PO) = 1.0 +- 0.1 eV; and E.A. (PO_2) = 3.3 +- 0.2 eV. From the threshold measured for the endothermic charge transfer reaction of FeO_2^- with NO_2, 0.77 +- 0.2 eV, the electron affinity of FeO_2 was determined to be 3.1 +- 0.2 eV. Results are discussed.

27863 (LA-UR—81-1690) Use of a free-expansion jet in ultra-high-resolution Raman spectroscopy. Valentini, J.J.; Esherick, P.; Owyoung, A. (Los Alamos National Lab., NM (USA); Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract W-7405-ENG-36. 6p. (CONF-810429—36). NTIS, PC A02/MF A01. Order Number DE81025386.

From Conference on optics; Santa Fe, NM, USA (6 Apr 1981).

Rotationally-resolved, ultra-high-resolution stimulated Raman spectra of CH_4, CD_4, and SF_6 have been obtained in cw and pulsed free-expansion jets, using a simple and inexpensive nozzle-and-vacuum-chamber apparatus. Through variation of the nozzle orifice diameter, nozzle backing pressure, and axial location of the spectroscopic probe region it is possible to nearly independently control the spectral Doppler width, rotational temperature, and molecular density in the jet. Using relatively mild expansion conditions, it is possible to cool a pure methane jet to a rotational temperature of 13K. It is shown how this control of temperature, independent of density, allows separation of otherwise unresolvable spectral features and unambiguous identification of band-heads, hot-bands, and other spectral features.

27864 (LBL—12472) Precise measurement of parity nonconservation in atomic thallium. Hunter, L.R. (Lawrence Berkeley Lab., CA (USA)). May 1981. Contract W-7405-ENG-48. 82p. NTIS, PC A05/MF A01. Order Number DE81025214.

Thesis.

Observation of parity non-conservation in the 6P/sub 1/2/ - 7P/sub 1/2/ transition in $_{81}Tl^{203\ 205}$ is reported. The transition is nominally forbidden M1 with amplitude M. Due to the violation of parity in the electron-nucleon interaction, the transition acquires an additional (parity nonconserving) amplitude e/sub p/. In the presence of an electric field, incident 293 nm circularly polarized light results in a polarization of the 7P/sub 1/2/ state through interference of the Stark amplitude with M and E/sub p/. This polarization is observed by selective excitation of the 7P/sub 1/2/ - (8S/sub 1/2) transition with circularly polarized 2.18 μm light and observation of the subsequent fluorescence at 323 nm. By utilizing this technique and carefully determining possible systematic contributions through auxiliary measurements, the circular dichroism $\delta = 2\mathrm{Im}(E/\text{sub } p/)/M$ is observed: $\delta/\text{sub exp/} = (2.8 + 1.0 - .9) \times 10^{-3}$. In addition, measurements of A(6D/sub 3/2/ - 7P/sub 1/2/) = (5.97 +- .78) x 10^5 s^{-1}, A(7P/sub 1/2/ - 7S/sub 1/2/) = (1.71 +- .07) x 10^7 s^{-1} and A(7P/sub 3/2/ - 7S/sub 1/2/) = (2.37 +- .09) s^{-1} are reported. These values are employed in a semiempirical determination of δ based on the Weinberg-Salam Model. The result of this calculation for $\sin^2\Theta/\text{sub } 2/ = .23$ is $\delta/\text{sub Theo/} = 1.7 +- .8) \times 10^{-3}$.

27865 (UCRL—85683) Uranium soft x-ray total attenuation coefficients. Del Grande, N.K.; Oliver, A.J. (Lawrence Livermore National Lab., CA (USA)). 1981. Contract W-7405-ENG-48. 6p. (CONF-810651—2). NTIS, PC A02/MF A01. Order Number DE81023659.

From 1981 topical conference on low-energy X-ray diagnostics; Livermore, CA, USA (8 Jun 1981).

Uranium total attenuation coefficients were measured continuously from 0.84 to 6.0 keV and at selected higher energies using a vacuum single crystal diffractometer and flow-proportional counter. Statistical fluctuations ranged from 0.5% to 2%. The overall accuracy was 3%. Prominent structure was measured within 20 eV of the M_5 (3.552 keV) and M_4 (3.728 keV) edges. Jump ratios were determined from log-log polynomial fits to data at energies apart from the near-edge regions. These data were compared with calculations based on a relativistic HFS central potential model and with previously tabulated data.

27866 Multiphoton ionization photoelectron spectroscopy of nitric oxide. Miller, J.C.; Compton, R.N. (Chemical Physics Section, Health and Safety Research Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Journal of Chemical Physics ;* **75**: No. 1, 22-29(1 Jul 1981).

We have investigated the photoelectron spectrum (PES) of nitric oxide following four-photon ionization resonant with various vibrational levels of the two-photon-allowed A state. The process studied was When the laser was tuned to each resonant vibrational state, two electron energy peaks were observed. For v = 0,1,2,3 the higher energy peak corresponds to direct ionization, leaving the positive ion in a single vibrational quantum state which is the same vibrational state as that of the initially excited nitric oxide Rydberg state. The origin of the lower energy peak representing near zero energy electrons is not understood at this time, but several possible mechanisms are discussed. The PES spectrum through the $A^2\Sigma^+$(v = 3) level indicates that two competing processes can occur: vibrational autoionization after three-photon absorption, or the "quasi-free—free" absorption of a fourth photon resulting in formation of the X $^1\Sigma$ (v = 3) state of the ion. Results of multiphoton ionization PES resonant with the C state are also presented.

27867 Angle-resolved photoelectron spectroscopy of CO_2 with synchrotron radiation. Grimm, F.A.; Allen, J.D. Jr.; Carlson, T.A.; Krause, M.O.; Mehaffy, D.; Keller, P.R.; Taylor, J.W. (University of Tennessee, Knoxville, Tennessee 37916). *Journal of Chemical Physics ;* **75**: No. 1, 92-98(1 Jul 1981).

The angular asymmetry parameter β has been determined for the first four bands in the photoelectron spectrum of CO_2 as a function of photon energy: X ^{2}Pi/sub g/(15—50 eV), A ^{2}Pi/sub u/(19—28 eV), B $^3\Sigma$/sub u/$^+$(19—28 eV), and C $^3\Sigma$/sub g/$^+$(21—67 eV). Use is made of a monochromatized beam of photons from the Wisconsin Synchrotron Radiation Center. The experimental results are compared with theoretical calculations employing the multiple scattering method and the overall agreement is good. In addition, the theoretical predictions for the effect on β of shape resonances have been verified except that the experimental widths are broader. This broadening has been partially accounted for in recent calculations of Swanson et al. by including the effects of vibrational motion. Finally, sharp changes in β as a function of vibrational level have been noted for the second and fourth electronic bands. Such behavior has been found for a variety of photon energies, and the results are examined against prevailing theory.

27868 Differential cross sections for electron capture from helium by 25- to 100-keV incident protons. Martin, P.J.; Arnett, K.; Blankenship, D.M.; Kvale, T.J.; Peacher, J.L.; Redd, E.; Sutcliffe, V.C.; Park, J.T.; Lin, C.D.; McGuire, J.H. (Physics Department, University of Missouri-Rolla, Rolla, Missouri 65401). *Physical Review* [*Section*] *A: General Physics ;* **23**: No. 6, 2858-2865(Jun 1981).

Experimentally and theoretically determined differential cross sections are reported for electron capture in collisions of protons with helium atoms for incident proton energies of 25, 30, 50, and 100 keV and for center-of-mass scattering angles of 0.0 to 2.0 mrad. The magnitudes of the experimentally determined differential cross sections decrease from 10^{-10} to 10^{-12} cm^2/sr within the 0.0—0.8-mrad range of the center-of-mass scattering angle. At approximately 0.8 mrad a distinct change in the slope of the differential cross section is observed. The experimental results which are for capture into all bound states of hydrogen are compared with the theoretical results of a calculation for capture into the ground state using the two-state two-center atomic expansion method in the eikonal approximation. Good agreement between the theoretical and the experimental results is obtained with a static potential which accounts for screening of the helium nucleus by a single passive electron.

27869 Electron-capture, electron-loss, and impact-ionization cross sections for 103- to 3400-keV/amu multicharged iron ions colliding with molecular hydrogen. Berkner, K.H.; Graham, W.G.; Pyle, R.V.; Schlachter, A.S.; Stearns, J.W. (Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Physical Review* [*Section*] *A: General Physics ;* **23**: No. 6, 2891-2904(Jun 1981).

We report cross-section measurements for collisions of multicharged iron ions with a molecular-hydrogen target: (a) electron capture and electron loss of the multicharged ions, and (b) impact ionization of the hydrogen target. Iron ions, Fe/sup +q/, were used with charge states q = 3—13 at 103 keV/amu, q = 9—16 at 294 keV/amu, q = 11—22 at 1160 keV/amu, and q = 20—25 at 3400 keV/amu. We find that an empirically determined expression for the electron-capture cross section, $\sigma = (1.2 \times 10^{-8})$ q/sup 3.15/ E(keV/amu)/sup -4.48/ cm^2/molecule, describes all the data at and above 275 keV/amu. These measurements are compared with recent theoretical calculations.

27870 Use of local exchange potentials in the calculation of photoionization and electron-ion scattering. Ritchie, B.; Pindzola, M.S.; Garrett, W.R. (Sandia Laboratories, Albuquerque, New Mexico 87185). *Physical Review* [*Section*] *A: General Physics ;* **23**: No. 6, 2905-2913(Jun 1981).

Several local approximations to exchange are investigated. These are compared against exact static-exchange results for e,Li^+ scattering and for the photoionization of the 2S and 2P state of Li. All except one are found to be fairly accurate for these cases. Calculations are also performed for photoionization of the 5D state of Cs, which exhibits an f-wave resonance. All exchange models studied for this case (including the Slater Xα) are found to give widely differing results on the position and width of this resonance. Calculations are also performed for the photoionization of the Cs 6P state and compared against experimental results.

27871 Bounds on mean excitation energies in terms of oscillator-strength moments. Shimamura, I.; Inokuti, M. (Institute of Space and Aeronautical Science, University of Tokyo, Komaba, Meguro-Ku, Tokyo 153, Japan). Contract W-31-109-ENG-38. *Physical Review* [*Section*] *A: General Physics ;* **23**: No. 6, 2914-2925(Jun 1981).

The logarithmic mean excitation energies that determine, for fast charged particles, the total inelastic-scattering cross section, the stopping power, and the straggling are bounded from above and below by simple expressions involving moments of the oscillator-strength distribution. A general condition under which the set of elementary inequalities gives tight bounds is indicated, and is illustrated in several examples. Effective oscillator-strength distributions that are constructed on the basis of variational principles lead to tighter bounds in terms of some of the moments and the oscillator strengths for some discrete excitations.

27872 Emission of 3914-A N_2/sup ts+/ radiation from charge-transfer excitation. Hoffman, J.M.; Lockwood, G.J.; Miller, G.H. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Physical Review* [*Section*] *A: General Physics ;* **23**: No. 6, 2983-2994(Jun 1981).

Using various projectile ions incident on an N_2 gas target, we have determined cross sections for the N_2/sup ts+/ 3914-A emission in coincidence with charge transfer from N_2 molecules to the projectiles. Ions of H and the inert gases, each in the energy range 10—100 keV, were used. As in charge transfer in which target and projectile are left in the ground state, the velocity at which the maximum cross section occurs increases as the magnitude of the potential energy change increases. Unlike the ground-state case, the value of the cross section at a fixed velocity is significantly greater for an exothermic reaction than for an endothermic reaction having the same magnitude of ΔE.

27873 Relativistic study of E1 and M1 transitions in the boron isoelectronic sequence. Vajed-Samii, M.; Ton-That, D.; Armstrong, L. Jr. (Department of Physics, The Johns Hopkins University, Baltimore, Maryland 21218). Contract DE-AS02-76ET53006. *Physical Review* [*Section*] *A: General Physics ;* **23**: No. 6, 3034-3047(Jun 1981).

The relativistic transition energies and electric-dipole oscillator strengths in length and velocity forms are calculated for ions of the boron sequence. Transitions from the $2s2p^2$, J = 1/2, 3/2, and 5/2 excited states to the $2s^22p$, J = 1/2 and 3/2 levels of the ground state are considered. The magnetic-dipole transition studied relativistically is that between the J = 1/2 and 3/2 levels of the ground state. The trends in the relative importance of relativistic contributions and correlation effects along the isoelectronic se-

quence for the different transitions are discussed. A more detailed study of the various effects contributing to the excitation energies and oscillator strengths of Fe XXII, and comparison with other available results for this ion is carried out.

27874 **Evidence for shape resonance in the C $^2u^+$/sub g/ band of CO_2/sup ts+/ from angle-resolved photoelectron spectroscopy.** Carlson, T.A.; Krause, M.O.; Grimm, F.A.; Allen, J.D. Jr.; Mehaffy, D.; Keller, P.R.; Taylor, J.W. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). Contract W-7405-ENG-26. *Physical Review* [*Section*] *A: General Physics ;* **23**: No. 6, 3316-3318(Jun 1981).

Angle-resolved photoelectron spectra were taken of the fourth band in CO_2 (C $^2\Sigma^+$/sub g/) as a function of photon energy using synchrotron radiation. It was found that the value of β dropped strongly in the vicinity of the photon energy of 42 eV. This result is shown to be in convincing agreement with theoretical predictions of a shape resonance, particularly when consideration is made of variations in internuclear distance.

27875 **Polarized He (2^3S) thermal metastable atom source.** Riddle, T.W.; Onellion, M.; Dunning, F.B.; Walters, G.K. (Department of Physics, Rice University, Houston, Texas 77001, and the Rice Quantum Institute). *Review of Scientific Instruments ;* **52**: No. 6, 797-801(Jun 1981).

A source of polarized He (2^3S) metastable atoms is described that provides a thermal energy beam with a flux of the order of $\sim 10^{14}$ metastables s^{-1} steradian^{-1} at a polarization P/sub z/$\sim$50%. The polarization of the beam can be simply reversed, or modulated, without changing the beam trajectory or flux. The beam contains no significant admixtures of He(2^1S) atoms, photons, or fast neutrals and is suitable for use in a wide variety of collision and surface physics experiments.

27876 **Temperature dependence of the anomalous muonium hyperfine interaction and depolarization rate in silicon.** Blazey, K.W.; Brown, J.A.; Cooke, D.W.; Dodds, S.A.; Estle, T.L.; Heffner, R.H.; Leon, M.; Vanderwater, D.A. (I.B.M. Research Laboratory, Zuerich, Switzerland). *Physical Review* [*Section*] *B: Condensed Matter ;* **23**: No. 10, 5316-5321(15 May 1981).

The temperature dependence of the anomalous muonium hyperfine interaction has been measured in silicon between 5 and 150 K. The hyperfine parameters are observed to decrease with increasing temperature. This is argued to result from interaction of the anomalous muonium center with the silicon host phonons. Above 120 K a rapid increase of the depolarization rate of the anomalous muonium with temperature is observed; these data are consistent with a Raman process causing the increased depolarization.

27877 **Low energy positrons from metal surfaces.** Dale, J.M.; Hulett, L.D. (Oak Ridge National Lab., TN (USA)); Pendyala, S. (State Univ. Coll., Fredonia, NY (USA)). *Surface and Interface Analysis ;* **2**: No. 6, 199-203(Dec 1980).

From Chemical and physical properties of solid surfaces; Lake Geneva, Wisconsin, USA (29 - 31 Oct 1979).

There is reason to believe that slow positron spectroscopy will have value for surface analyses, but in order to develop practical methods it is necessary to devise monoenergetic sources of positrons that output usable intensities. This paper describes how this can be achieved by preparing certain metal surfaces to act as moderators for fast positrons from radioactive sources. After entering the moderator, the positrons are thermalized and a certain fraction are re-emitted back into the vacuum. They can then be extracted by an electrostatic field and accelerated to any desired energy. Yields of low energy positrons were found to be generally large for certain metals having negative positron work functions (theoretically calculated). It is also necessary to minimize bulk defects, which act as positron traps. Tungsten and molybdenum are metals having negative work functions which can be easily prepared as effective moderators by simply heating in vacuum. This effects a cleaning by volatilizing oxides and anneals defects. The inertness of their surfaces towards oxidation allows them to maintain the negative work function effect which might otherwise be reduced by exposure to air and poor vacuum. These results have been utilized by the authors to design a monoenergetic positron gun to measure discrete energy losses in reflection spectra and threshold absorption effects. A Brandeis University group has used a tungsten moderator gun to make the first experimental measurements of low energy positron diffraction spectra.

27878 **Effect of source window material and thickness on the intensity of moderated positrons.** Hulett, L.D.; Dale, J.M. (Oak Ridge National Lab., TN (USA)); Pendyala, S. (State Univ. Coll., Fredonia, NY (USA)). *Surface and Interface Analysis ;* **2**: No. 6, 204-206(Dec 1980).

From Chemical and physical properties of solid surfaces; Lake Geneva, Wisconsin, USA (29 - 31 Oct 1979).

When fast positrons from a radioactive source such as ^{58}Co or ^{22}Na are impinged on a suitably prepared moderator surface, a measurable fraction (approximately 0.1%) is re-emitted as a monoenergetic beam. Several groups have efforts underway to implement this phenomenon as a practical monoenergetic positron gun to be used for surface studies. To address the question that arises about the effects of the window of the capsule that contains the fast positron source, moderated positron intensities have been measured for windows constructed of several different materials of varying thicknesses. A semilog plot of the data approximates a universal curve, with all points on the same line regardless of material. A ^{58}Co source can be masked by windows as thick as 22 μm Al or 11 μm Ti without decreasing the moderated positron intensity by more than 35%. Since ^{22}Na has a similar fast β^+ spectrum, we have the implication that window effects for sources of this material will be of the same degree.

6404 Fluid Physics

27879 **(LA-UR—81-942) Quantitative measurements of light scattering in decomposing ^{3}He-^{4}He liquid mixtures.** Sinha, D.N.; Hoffer, J.K. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 3p. (CONF-810809—2). NTIS, PC A02/MF A01.

From 16. international conference on low temperature physics; Los Angeles, CA, USA (19 Aug 1981).

Measurements are presented of the angular distribution of light scattering by decomposing ^{3}He-^{4}He mixtures. It is found that the structure factor has a scaling form $S(\kappa,t) = \kappa$/sub m/$^{-3}$ $F(\kappa/\kappa$/sub m/) where κ/sub m/$^{-1}$ is related to the size of a growing domain and F(x) is time independent during the early stages of phase separation.

27880 **(LBL—12627) Numerical study of incompressible slightly viscous flow past blunt bodies and airfoils.** Cheer, A.Y.L. (Lawrence Berkeley Lab., CA (USA)). May 1981. Contract W-7405-ENG-48. 95p. NTIS, PC A05/MF A01. Order Number DE81025679.

Thesis.

A grid free numerical method is used to simulate incompressible flow at high Reynolds number. The numerical method simulates the flow inside the boundary layer by vortex sheets and the flow outside this layer by vortex blobs. The algorithm produces a smooth transition between the sheets and the blobs. The accuracy of this hybrid numerical method is tested in several numerical experiments. In the first experiment, the algorithm is used to simulate slightly viscous flow past a circular cylinder. In the second experiment, the algorithm is used to simulate flow past a Joukowski airfoil at various angles of attack. In the latter case, there is no evidence of blow-up of the flow at the trailing edge of the airfoil. In both experiments, the calculated flow and its functionals (such as lift and drag coefficients) are in good agreement with both theoretical results and wind tunnel experiments.

27881 **Solving the stiff ODE's of the kinetics of chemically reacting gas flow.** Karasalo, I.; Kurylo, J. (Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). Contract W-7405-ENG-48. *Journal of Computational Physics ;* **39**: No. 3, 167-182(1 Mar 1981).

We study the efficiency of computational methods for the stiff ordinary differential equations of chemical kinetics that arise when the partial differential equations of chemically reacting gas flow are treated by a fractional step technique. In this application, the overhead work associated with evaluating partial derivatives

and decomposing matrices for the Newton-like corrector iterations used in most algorithms for stiff ODE's can be eliminated for the most part by keeping in store a small number of suitable chosen copies of the Jacobian matrix, reduced to Hessenberg form to facilitate changes of stepsize and order. Computational results in the case of ignition and propagation of one-dimensional, premixed laminar flame with different realistic chemical kinetic models are presented to show the reduction of computational work obtained by modifying a modern general-purpose ODE-code in this manner.

6451 Particle Interactions And Properties - Experimental

REFER ALSO TO CITATION(S) 27610, 27840, 27912

27882 (CONF-8006127—5) Test the interacting boson model by pion-nucleus inelastic scattering. Lee, T.S.H.; Iachello, F. (Argonne National Lab., IL (USA); Yale Univ., New Haven, CT (USA). Dept. of Physics; Rijksuniversiteit Groningen (Netherlands). Kernfysisch Versneller Inst.). 1980. Contract W-31-109-ENG-38. 8p. NTIS, PC A02/MF A01. Order Number DE81023525.

From International conference on interacting bose-fermi systems in nuclei; Erice, Sicily, Italy (12 Jun 1980).

It is shown that the comparison between π^+ and π^- cross sections can be used to test the IBA of Arima and Iachello.

27883 (SLAC-PUB—2721) Measurements of the decays tau⁻ → rho⁻ ν/sub tau/, tau⁻ → π⁻ ν/sub tau/ and tau⁻ → K*-(892)ν/sub tau/ using the MARK II detector at SPEAR. Dorfan, J. (Stanford Linear Accelerator Center, CA (USA)). Apr 1981. Contract AC03-76SF00515. 8p. (CONF-810376—2). NTIS, PC A02/MF A01. Order Number DE81025145.

From 16. rencontre de moriond: nonperturbative QCD: theory and experiment; Les Arcs, France (15 Mar 1981).

Measurements of the branching fractions for the Cabibbo favored decays tau⁻ → rho⁻ → π⁻ ν/sub tau/ and the Cabibbo suppressed decay mode tau⁻ → K*⁻ (892)ν/sub tau/ are presented. The energy dependence of the tau⁺ tau⁻ production cross section is obtained for the decays tau⁻ → rho⁻ ν/sub tau/ and these spectra agree well with the classification of the tau⁻ as a spin-1/2 point particle. Fits to the production cross section yield a measurement of M/sub tau/ = (1787 +- 10) MeV/c² for the tau mass. Ninety-five percent confidence upper limits for the forbidden decay tau⁻ → K*⁻ (1430)ν/sub tau/ and the tau neutrino mass are presented.

27884 Study of the isospin structure of single-pion production in charged-current neutrino interactions. Baker, N.J.; Cnops, A.M.; Connolly, P.L.; Kahn, S.A.; Murtagh, M.J.; Palmer, R.B.; Samios, N.P.; Tanaka, M. (Brookhaven National Laboratory, Upton, New York 11973). *Physical Review [Section] D: Particles and Fields ;* **23**: No. 11, 2495-2498(1 Jun 1981).

The isospin structure of weak single-pion production in the reactions $\nu p \to \mu^- p\pi^+$, $\nu n \to \mu^- p\pi^0$, and $\nu n \to \mu^- n\pi^+$ has been studied using the 7-foot deuterium bubble chamber exposed to a wide-band neutrino beam at BNL. We find that the I = 1/2 Nπ amplitude is substantial even in the $\Delta(1232)$ mass region and the relative phase angle psi is approximately 90° as predicted by the Adler model.

27885 Quasielastic neutrino scattering: A measurement of the weak nucleon axial-vector form factor. Baker, N.J.; Cnops, A.M.; Connolly, P.L.; Kahn, S.A.; Kirk, H.G.; Murtagh, M.J.; Palmer, R.B.; Samios, N.P.; Tanaka, M. (Brookhaven National Laboratory, Upton, New York 11973). *Physical Review [Section] D: Particles and Fields ;* **23**: No. 11, 2499-2505(1 Jun 1981).

The quasielastic reaction ν/sub μ/n → μ⁻ p was studied in an experiment using the BNL 7-foot deuterium bubble chamber exposed to the wide-band neutrino beam with an average energy of 1.6 GeV. A total of 1138 quasielastic events in the momentum-transfer range Q^2 = 0.06 —3.00 (GeV/c)² were selected by kinematic fitting and particle identification and were used to extract the axial-vector form factor F/sub A/(Q^2) from the Q^2 distribution. In the framework of the conventional V-A theory, we find that the dipole parametrization is favored over the monopole. The value of the axial-vector mass M/sub A/ in the dipole parametrization is 1.07 +- 0.06 GeV, which is in good agreement with both recent neutrino and electroproduction experiments. In addition, the standard assumptions of conserved vector current and no second-class currents are checked.

27886 Kaonic mass by critical absorption of kaonic-atom x rays. Lum, G.K.; Wiegand, C.E.; Kessler, E.G. Jr.; Deslattes, R.D.; Jacobs, L.; Schwitz, W.; Seki, R. (Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). *Physical Review [Section] D: Particles and Fields ;* **23**: No. 11, 2522-2532(1 Jun 1981).

The energy of x rays from the transition 6h→5g in kaonic atoms of potassium falls on the K absorption edge of erbium. Measurement of the kaonic-x-ray attenuation in a precisely calibrated set of Er foils yields the x-ray energy 57 458.8 +- 6.3 eV. The kaon mass is related to energy through the Klein-Gordon equation plus corrections for radiative effects, electron screening, and other effects. The negative-kaon mass was found to be 493.640 +- 0.054 MeV/c² in agreement with the currently accepted value 493.669 +- 0.018 MeV/c² which was determined from x rays emitted by high-Z atoms where the corrections were larger than for Z = 19.

27887 Search for narrow structures in the p-barp annihilation cross section from 1925 to 1960 MeV. Lowenstein, D.I.; Peaslee, D.C.; Bromberg, C.; Lewis, R.A.; Miller, R.; Oh, B.Y.; Potter, T.; Smith, G.A.; Whitmore, J.; Brando, T.; Kalogeropoulos, T.E.; Onengut, G.; Petridou, C.; Singer, M.; Tzanakos, G.S. (Brookhaven National Laboratory, Upton, New York 11973). *Physical Review [Section] D: Particles and Fields ;* **23**: No. 11, 2788-2790(1 Jun 1981).

The p-barp annihilation cross section has been measured over the mass range 1925—1960 MeV with RMS resolution of +- 2.5 MeV. This search yields no evidence for narrow enhancements in this mass interval. Using an A+B/p parametrization of the background, a 2-standard-deviation upper limit of 16 mb MeV is set for the integrated area of any resonance with mass between 1936 and 1942 MeV and width < or ≈4 MeV.

27888 Observation of the transition Y′→Yπ⁺π⁻→e⁺e⁻π⁺π⁻. Mageras, G.; Boehringer, T.; Costantini, F.; Dobbins, J.; Franzini, P.; Han, K.; Herb, S.W.; Lederman, L.M.; Peterson, D.; Rice, E.; Yoh, J.K.; Finocchiaro, G.; Lee-Franzini, J.; Giannini, G.; Schamberger, R.D. Jr.; Sivertz, M.; Spencer, L.J.; Tuts, P.M.; Imlay, R.; Levman, G.; Blanar, G.; Pauss, F.; Vogel, H. (Columbia University, New York, New York, 10027). *Physical Review Letters ;* **46**: No. 17, 1115-1118(27 Apr 1981).

In a sample of 10 000 Y′ decays observed with the CUSB nonmagnetic detector at the Cornell Electron Storage Ring we find 23 events consistent with the decay Y′→Yπ⁺π⁻→e⁺e⁻π⁺π⁻. We derive a branching fraction of 0.20 +- 0.07 for Y′→Yπ⁺π⁻ and estimates of the partial width for this decay. The invariant mass spectrum of the pion pairs shows a strong preference for large di-pion mass.

27889 Search for baryon-exchange production of strange exotic mesons. Bionta, R.M.; Carroll, A.S.; Edelstein, R.M.; Green, D.R.; Makuchowski, E.J.; Morrissey, S.P.; Russ, J.S.; Russell, J.J.; Sharfman, N.; Sutton, R.B. (Brookhaven National Laboratory, Upton, New York 11973). *Physical Review Letters ;* **46**: No. 15, 970-973(13 Apr 1981).

Results are presented of a search for strange, doubly charged, narrow [FWHM< or =0.2 (GeV/c²)²] meson states produced in the baryon exchange reaction $\pi^+ p \to \Lambda/\text{sub } f/^0 S^{++}$ at 9.8 GeV/c. No evidence is found for such states. The 95% confidence limit for the production cross section is <20 nb for M(S^{++})< or =2 GeV/c². Limits on σB from a kinematic reconstruction of final states with $S^{++} \to K^+\pi^+$ are < or =10 nb for M($K^+\pi^+$)< or =2.0 GeV/c².

27890 **Neutrino instability.** Sobel, H.W.; Reines, F.; Pasierb, E. (Univ. of California, Irvine). pp 21-36 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

Indications of neutrino instability have been observed from data on the processes: anti ν/sub e/ + d → n + n + e^+ (charged current) and anti ν/sub e/ + d → n + p + anti ν/sub e/ (neutral current). Although the deuteron reaction is not the ideal way to search for neutrino oscillations, it has a number of attractive features which allow us to sidestep many of the problems currently inherent in reactor neutrino studies. The reactor is a good source since it provides a very intense (2 x 10^{13} anti ν/sub e/cm^{-2} sec^{-1}) pure source of anti ν's at low energies (<10 MeV). The difficulty has been the uncertainty in the anti ν/sub e/ spectrum.

6452 Particle Interactions And Properties - Theoretical

REFER ALSO TO CITATION(S) 27598, 27600, 27606, 27611, 27612, 27837, 27853, 27854, 27908, 27914

27891 **(FERMILAB—81/37) Magnetic monopole bibliography, 1977-1980.** Craven, R.E.; Trower, W.P.; Carrigan, R.A. Jr. (Fermi National Accelerator Lab., Batavia, IL (USA); Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Physics). May 1981. Contract AC02-76CH03000. 38p. NTIS, PC A03/MF A01. Order Number DE81025677.

A bibliography of 651 entries related to Grand Unification Magnetic Monopoles is presented. Each entry is categorized into one of 26 different subcategories. (GHT)

27892 **(SLAC-PUB—2733) Large-angle two-photon exclusive channels in quantum chromodynamics.** Brodsky, S.J.; Lepage, G.P. (Stanford Linear Accelerator Center, CA (USA); Cornell Univ., Ithaca, NY (USA). Lab. of Nuclear Studies). May 1981. Contract AC03-76SF00515. 24p. (CONF-810496—1). NTIS, PC A02/MF A01. Order Number DE81025089.

From 4. international colloquium on photon-photon interactions; Paris, France (6 Apr 1981).

Detailed leading order QCD predictions are given for the scaling, angular, and helicity dependence of the reactions $\gamma\gamma \rightarrow M$ anti M (M = π, K, rho, etc.) at large momentum transfer. In addition to providing a basic test of QCD at short distances, measurements can be used to determine the process-independent meson distribution amplitudes phi/sub M/(x,Q). Other related two-photon channels such as $\gamma\gamma \rightarrow \gamma$rho, $\gamma^*\gamma \rightarrow \pi^0$, eta^0, eta' and eta/sub c/ $\rightarrow \gamma\gamma$ are also discussed. The existence of a fixed Regge singularity at J = 0 which couples to γrho → γrho in the t-channel but not $\gamma\pi \rightarrow \gamma\pi$ is also proved.

27893 **Dilepton production from collisions of polarized spin-1/2 hadrons. I. General kinematic analysis.** Donohue, J.T.; Gottlieb, S. (High Energy Physics Division, Argonne National Laboratory, Argonne, Illinois 60439). *Physical Review* [*Section*] *D: Particles and Fields ;* **23**: No. 11, 2577-2580(1 Jun 1981).

The kinematics for the production of lepton pairs from collisions of polarized spin-1/2 particles is discussed on the basis of rotational covariance and the Jacob-Wick helicity formalism. It is assumed that the leptons come from the decay of a single vector particle.

27894 **Dilepton production from collisions of polarized spin-1/2 hadrons. II. Parton-model predictions.** Donohue, J.T.; Gottlieb, S. (High Energy Physics Division, Argonne National Laboratory, Argonne, Illinois 60439). Contract W-31-109-ENG-38. *Physical Review* [*Section*] *D: Particles and Fields ;* **23**: No. 11, 2581-2595(1 Jun 1981).

Parton-model predictions for lepton-pair production from polarized spin-1/2 particles are considered within the context of a formalism explained in a companion paper. The polarization effects in the quantum-chromodynamic 2→2 subprocesses which contribute to lepton-pair production are found to be quite simple. Following the work of Ralston and Soper, polarized distribution functions are defined for gluons as well as quarks. Finally, a detailed discussion of polarization and the hard-scattering formalism is presented for the two cases of intrinsic parton transverse momentum allowed or forbidden.

27895 **Final-state interactions in the decays of charmed mesons.** Sorensen, C. (High Energy Physics Division, Argonne National Laboratory, Argonne, Illinois 60439). *Physical Review* [*Section*] *D: Particles and Fields ;* **23**: No. 11, 2618-2624(1 Jun 1981).

Decays of (charmed) D mesons into two pseudoscalars are considered, with emphasis on final-state interactions. Uncertainties in the determination of final-state-interaction corrections that arise from theoretical ambiguities, and from incomplete meson-meson scattering data are discussed. Corrections for $\pi\pi$, K-barK, and K-barπ final states are evaluated. It is concluded that a quark-spectator model with final-state interactions cannot explain all of the unexpected rates for two-body decays of charmed pseudoscalars.

27896 **Further evidence for flavor independence of the quark-antiquark potential.** Quigg, C.; Rosner, J.L. (Fermi National Accelerator Laboratory, P. O. Box 500, Batavia, Illinois 60510). *Physical Review* [*Section*] *D: Particles and Fields ;* **23**: No. 11, 2625-2637(1 Jun 1981).

An inverse-scattering algorithm is used to construct the interquark potential from the masses and leptonic widths of vector mesons. There is substantial agreement between potentials constructed from the 1S and 2S levels of the psi family, and those based upon the 1S-4S levels of the Y family. This agreement provides evidence that the quark-antiquark interaction is independent of heavy-quark flavor for interquark separations between about 0.1 and 1 fm. Self-consistency of the various determinations is explored at some length, and the uncertainties inherent in the method are investigated in detail. Predictions are made for electric-dipole transition rates in the Y family, and the significance of future measurements for refining and extending present knowledge of the potential is discussed.

27897 **Beyond Y: Heavier quarkonia and the interquark force.** Moxhay, P.; Rosner, J.L.; Quigg, C. (School of Physics and Astronomy, University of Minnesota, Minneapolis, Minnesota 55455). *Physical Review* [*Section*] *D: Particles and Fields ;* **23**: No. 11, 2638-2646(1 Jun 1981).

A quarkonium potential constructed by inverse-scattering methods from the masses and leptonic decay widths of the Y vector mesons provides a basis for extrapolation to heavier quark-antiquark bound states. Level spacings and leptonic widths are predicted for systems with ground-state masses up to 60 GeV/c^2. It is found that present uncertainties in the potential at short distances would be most conclusively resolved by measurement of the $1\ ^3S_1$ leptonic decay rate. Less definitive but still of value would be determinations of the 2S-1S or 2S-2P level spacings, and measurement of the ratio of 2S and 1S leptonic widths. Other properties of the next quarkonium family are less sensitive indicators of short-range behavior, and can be anticipated with some confidence from experimental results already in hand. These serve to test further the flavor independence of the interquark potential.

27898 **Natural flavor conservation.** Rothman, A.C.; Kang, K. (Department of Physics, The Ohio State University, Columbus, Ohio 43210). Contract DE-AC02-76ER03130.A005. *Physical Review* [*Section*] *D: Particles and Fields ;* **23**: No. 11, 2657-2665(1 Jun 1981).

It is shown that the fiats of natural flavor conservation for an arbitrary U(1)-unbroken gauge theory require that all quarks of a given charge and helicity transform identically under the gauge group.

27899 **Intrinsic heavy-quark states.** Brodsky, S.J.; Peterson, C.; Sakai, N. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). Contract DE-AC03-76SF00515. *Physical Review* [*Section*] *D: Particles and Fields ;* **23**: No. 11, 2745-2757(1 Jun 1981).

The postulate that ordinary hadrons contain intrinsic charm-quark states (such as uudcc-bar> in the proton) at the 1% level is

shown to explain two sets of unexpected experimental results: (1) the copious diffractive production of charmed hadrons at large longitudinal momentum in high-energy proton-nucleon and pion-nucleon collisions, and (2) the anomalously large number of same-sign dimuon events observed in deep-inelastic neutrino reactions. We also predict cross sections for open b and t production for high-energy hadron-hadron collisions.

27900 **Meaningful thrust variable for massive quarks.** Gottschalk, T. (California Institute of Technology, Pasadena, California 91125). Contract DE-AC-03-ER0068. *Physical Review [Section] D: Particles and Fields ;* **23**: No. 11, 2779-2780(1 Jun 1981).

We point out that the use of the conventional massless-quanta definition of thrust in perturbative jet calculations with massive quarks and/or gluons leads to physically meaningless results. In particular, the perturbative thrust value underlying a collinear system of detected hadrons is indeterminate. We then suggest a simple generalization of the conventional thrust definition which avoids these difficulties.

27901 **Pade phenomenology for NN scattering: $^1S_0$ phase shifts.** Hartt, K. (Theoretical Division, Los Alamos Scientific Laboratory, University of California, Los Alamos, New Mexico 87545). *Physical Review [Section] C: Nuclear Physics ;* **23**: No. 6, 2399-2404(Jun 1981).

Recently developed Pade approximant techniques are applied to two sets of $^1S_0$ NN scattering data. In the first, the unconstrained $^1S_0$ np phase shifts of MacGregor et al. are used to generate a scattering function, $F(k^2) = k\cot(\delta_0)$, which is fitted with high precision. A six-parameter [3/2] Pade fit gives four terms of the effective range expansion; the resulting Marchenko-type potential is expressible as the sum of a Yukawa one-pion-exchange potential and a shorter range part, the repulsion peaking at the origin at near 4 GeV. In a second application, Pade fits are made to the scattering function of the Reid soft-core potential. The [3/2] approximant which fits $F(k^2)$ through the wave numbers consistent with the Lambert, Corbella, and Thome criterion, to $k = 2.5$ fm^{-1}, leads to a potential with a core height of 4.6×10^4 GeV. In both [3/2] potentials the volume integrals are large and negative, and cannot be made positive by adjoining more repulsive high energy phase shifts. By application to the Reid soft-core potential the Pade formalism is shown to generate useful [L/L-1] Pade approximants with increasing L. The analytic structure of $F(k^2)$ beyond $k = 224$ fm^{-1} is used in the construction of higher Pade approximants that (a) satisfy the Lambert, Corbella, and Thome criterion and (b) might lead to saturation.

27902 **Existence of dibaryon resonances in I = 1, $^1D_2$ and $^3F_3$ nucleon-nucleon scattering.** Bhandari, R.; Arndt, R.A.; Roper, L.D.; VerWest, B.J. (Center for Analysis of Particle Scattering, Department of Physics, Virginia Polytechnicc Institute and State University, Blacksburg, Virginia 24061). *Physical Review Letters ;* **46**: No. 17, 1111-1114(27 Apr 1981).

Recent, precise analyses of p-p and n-p scattering data up to 800 MeV by Arndt et al. have provided the strongest evidence to date for the existence of dibaryon states in the I = 1, $^1D_2$ and $^3F_3$ nucleon-nucleon channels. Model fits to their new phases reveal poles located near the "NΔ" threshold (2.15-0.05i GeV). Because of their strong coupling to this channel, these dibaryon resonances are highly inelastic.

27903 **Tests of SU(7) unification.** Cox, P.H.; Frampton, P.H.; Yildiz, A. (Research Laboratories of Mechanics, University of New Hampshire, Durham, New Hampshire 03824). Contract ER78-5-02-4999;EY76-C-02-3064. *Physical Review Letters ;* **46**: No. 16, 1051-1054(20 Apr 1981).

Predictions based on our proposed SU(7) unification of color, electroweak and generation symmetries are obtained concerning neutrino masses and mixing, and concerning B-meson decay modes.

27904 **Have we seen our first glueball?.** Chanowitz, M. (Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). Contract W-7405-ENG-48. *Physical Review Letters ;* **46**: No. 15, 981-984(13 Apr 1981).

Evidence is presented that there are at least two states near 1.4 GeV which decay to KKπ. One is E(1420), an axial vector, and the other is G(1440), probably a pseudoscalar. The pseudoscalar is likely to be a glueball.

27905 **Prompt muons in very high energy cosmic rays.** Halzen, F. (Univ. of Wisconsin, Madison). pp 281-296 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

A review is presented of how deep underground (water) muon experiments can yield information on important physics questions at energies in excess of those reached by accelerators. The physics issues fall into two categories: (1) new sources of prompt muons (heavy quarks and their decay products, e.g., new heavy leptons); (2) large-p/sub T/ physics or the study of deep inelastic hadronic collisions. Study of the lighter heavy quarks (charm, beauty) in prompt muon experiments is, however, difficult and competition with the very successful emulsion techniques must be considered. The intriguing track record of cosmic ray experiments in exploring large P/sub T/ phenomena is reviewed. The discussion includes physics questions to be studied at higher energies regarding these and other phenomena resulting in spectacular muon signatures, e.g., $Z \rightarrow \mu^+ \mu^-$.

27906 **Neutrino oscillations and matter effects.** Pakvasa, S. (Univ. of Hawaii, Honolulu). pp 45-58 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

The phenomenology of neutrino mixing and oscillations is reviewed, and the importance of effect of matter is discussed.

27907 **If intermediate Weinberg-Salam boson will not be found...** Berezinsky, V.S.; Smirnov, A.Y. (USSR Academy of Sciences, Moscow). pp 258-265 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

A simple electroweak $SU_2 \times U_1 \times U_1'$-model has a usual fermion sector and a charged W-boson with the mass arbitrary ranged from 100 to 400 GeV. The model is in agreement with all available 4-fermion experimental data. The characteristic observational features appeared in resonant production of ultra heavy intermediate bosons are discussed.

6453 Particle Invariance Principles And Symmetries

REFER ALSO TO CITATION(S) 27864

27908 **Problem for theories with spontaneous CP violation and natural flavor conservation.** Sanda, A.I. (Rockefeller University, New York, New York 10021). Contract DE-AC02-76ER02232B.000. *Physical Review [Section] D: Particles and Fields ;* **23**: No. 11, 2647-2653(1 Jun 1981).

Using a vacuum-saturation approximation, Vainshtein, Zakharov, and Shifman have shown that L = L/sub QCD/+L/sub EW/ can explain the $\Delta I = 1/2$ rule of strange-particle decays. Requiring L/sub EW/ to possess spontaneous CP violation and natural flavor conservation, we estimate ϵ'/ϵ using a similar approximation. We show that a very crude computation results in a very stringent limit $0.050 > \epsilon'/\epsilon > 0.048$. This estimate is in conflict with the experimental measurement $\epsilon'/\epsilon = 0.003 \pm 0.015$. This is a problem for theories with spontaneous CP violation and natural flavor conservation if the above understanding of the $\Delta I = 1/2$ rule is correct.

27909 Difficulty for the Weinberg model of CP nonconservation through Higgs-boson exchange. Deshpande, N.G. (Institute of Theoretical Science, University of Oregon, Eugene, Oregon 97403). Contract EY-76-5-06-2230. *Physical Review [Section] D: Particles and Fields ;* **23**: No. 11, 2654-2656(1 Jun 1981).

We evaluate the CP-violation parameter ϵ'/ϵ in the Weinberg model of CP nonconservation. When gluon-exchange effects are included, we find $\epsilon'/\epsilon \sim -0.045$, which is in conflict with the experimental measurement $\epsilon'/\epsilon = -0.003 +- 0.015$.

27910 SU(2) x U(1) x U'(1) models which are slightly different from the Weinberg-Salam model. Gao, C.; Wu, D. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). Contract DE-AC03-76SF00515. *Physical Review [Section] D: Particles and Fields ;* **23**: No. 11, 2686-2689(1 Jun 1981).

We discuss SU(2) x U(1) x U'(1) models by a uniform formula which is convenient for their comparison with the standard Weinberg-Salam model. As examples, we give three interesting models which are based on different grand unification models. In one model, U'(1) does not contribute to the electromagnetic interaction; in the other two, both U(1) and U'(1) do contribute to the electromagnetic interaction. Also, the first two models can approach the standard Weinberg-Salam model as close as one wants; but the third model has limitations on it.

27911 Unification scales. Chakrabarti, J. (Department of Physics and Astronomy, University of Rochester, Rochester, New York 14627). Contract DE-AC02-76ER13065. *Physical Review [Section] D: Particles and Fields ;* **23**: No. 11, 2719-2723(1 Jun 1981).

In flavor grand unified models: such as SU(8): we try to arrive at the scale at which flavor unification occurs. Simple phenomenological consequences of such theories are explored. Two examples are presented that have irreducible fermion representations.

27912 Kolar gold field baryon stability experiment. Krishnaswamy, M.R. (Tata Inst. of Fundamental Research, Bombay, India); Menon, M.G.K.; Mondal, N.K.; Narasimham, V.S.; Hayashi, Y.; Ito, N.; Kawakami, S.; Miyake, S. pp 1-9 of DUMAND-80. Stenger, V.J. (ed.). Honolulu, HI; Hawaii DUMAND Center (1981).

From International DUMAND symposium; Honolulu, HI, USA (24 Jul 1980).

In the gold mines at Kolar Gold Fields, measurements were made over the past two decades to study cosmic ray phenomena, i.e., muon and neutrino interactions as well as exotic processes such as Kolar events, anomalous cascades, muon bundles, etc. This has led to a detailed understanding of the intensities and interaction properties of cosmic ray particles in deep underground sites - vital factor in undertaking new, low-counting rate experiments. For a proton-stability experiment to be viable it is also necessary to know how to recognise the background and eliminate it from the sample of events so that the level of sensitivity is increased and the results are unambigouus. The neutrino experiments conducted in KGF during 1965 to 1969 at a depth of 2300 m come in handy for recognition of neutrino backgrounds. These involved simple telescopes with scintillators, striated absorbers and visual detectors as well as magnetic spectrographs, with a total area $\sim$ 50 m^2. In addition to cosmic ray muons and their secondaries, events due to ν-collisions in rock as well as inside the detector were recorded in these experiments; for some of them the momentum of the leading lepton has also been measured. These data provide us with a good experimental base for undertaking large scale experiments in which decay channels of bound nucleons are sought. A new experiment has been proposed in January 1980 to look specifically for decay of bound protons and neutrons in the lifetime regions up to 5 x 10^{31} years. This detector was constructed and started observation at the end of October 1980.

6454 Field Theory

REFER ALSO TO CITATION(S) 27894, 27895, 27900, 27904, 27909, 27910, 27911

27913 (BNL—29550) Framework for generating multi-monopole solutions. Chau Wang, L.L. (Brookhaven National Lab., Upton, NY (USA)). 1981. Contract AC02-76CH00016. 32p. NTIS, PC A03/MF A01. Order Number DE81025072.

The 't Hooft-Polyakov monopole solution is discussed and it is shown that in the limit of vanishing Higgs potential the monopole solution corresponds to the self-dual Yang-Mills solution depending only on three of the four coordinates. The formulation of self-dual Yang-Mills equations in complex 4-Euclidean space, the R-gauge and the BI transformation are presented. In this formulation every BI-transformation increases the monopole charge by one unit, if the resulting solution can be shown to have non-singular energy density and real potential. The conditions for non-singularity and reality are explicitly given. The explicit one and two monopole solutions are discussed in this formalism. The multi-monopole solutions of Prasad and Rossi are given, with comment on the use of the BI transformation to generate solutions to the Ernst equation, which miraculously is identical to self-dual Yang-Mills equation in the R-gauge for geometry with axial symmetry.

27914 Possible SU(4)/sub c/ x SU(3)/sub f/ x U(1) model. Gao, C.; Chou, K. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). Contract DE-AC03-76SF00515. *Physical Review [Section] D: Particles and Fields ;* **23**: No. 11, 2690-2701(1 Jun 1981).

An anomaly-free model of strong and electroweak interactions involving leptons and quarks in the SU(4)/sub c/ x SU(3)/sub f/ x U(1) gauge theory is constructed. After spontaneous symmetry breaking, it reduces to quantum chromodynamics for strong interactions and a broken SU(3) x U(1) model for electroweak interactions. As a limiting case it gives the same results as those of the Weinberg-Salam model in the low-energy region. The Weinberg angle is bounded by $\sin^2\theta$/sub W/ $< 1/4$ and becomes slightly less than 30° in the limiting case. Below the mass scale of SU(4)/sub c/ breaking there exists an inequality between the Weinberg angle and the strong coupling constant, which is consistent with experiments. A correction to the neutral current of the Weinberg-Salam model is suggested. A new conserved quantum number is introduced in this model and there exist several new fermions with masses lighter than 160 GeV. The Kobayashi-Maskawa expression of Cabibbo mixing for quarks may be obtained in the model, generalized to include several generations of fermions.

65 PHYSICS RESEARCH

6511 Experimental Techniques

27915 (CONF-810695—1) Determination of the neutron magnetic moment. Greene, G.L.; Ramsey, N.F.; Mampe, W.; Pendlebury, J.M.; Smith, K.; Dress, W.B.; Miller, P.D.; Perrin, P. (Oak Ridge National Lab., TN (USA); Harvard Univ., Cambridge, MA (USA); Institut Max von Laue - Paul Langevin, 38 - Grenoble (France); Sussex Univ., Brighton (UK). Astronomy Centre). 1981. Contract W-7405-ENG-26. 14p. NTIS, PC A02/MF A01. Order Number DE81024116.

From 2. international conference on precision measurements and fundamental constants; Gaithersburg, MD, USA (Jun 1981).

The neutron magnetic moment has been measured with an improvement of a factor of 100 over the previous best measurement. Using a magnetic resonance spectrometer of the separated oscillatory field type capable of determining a resonance signal for both neutrons and protons (in flowing H_2O), we find μ/sub n//μ/sub p/ = 0.68497935(17) (0.25 ppM). The neutron magnetic moment can also be expressed without loss of accuracy in a variety of other units.

6512 Nuclear Properties And Reactions, A=1-5

REFER ALSO TO CITATION(S) 27915

6513 Nuclear Properties And Reactions, A=6-19

27916 Analysis of the $^{14}N+^{12}C$ heavy-ion reaction. Cusson, R.Y.; Gomez del Campo, J.; Maruhn, J.A.; Maruhn-Rezwani, V. (Physics Department, Duke University, Durham, North Carolina 27706). Contract W-7405-ENG-26. *Physical Review* [*Section*] *C: Nuclear Physics ;* **23**: No. 6, 2524-2531(Jun 1981).

The ^{14}N (E/sub lab/ = 106 and 167 MeV) + ^{12}C heavy-ion reaction is analyzed in terms of a modified version of the semiclassical scattering model of Broglia followed by an evaporation calculation. The deflection and energy loss functions are taken from recent time dependent Hartree-Fock calculations. The complete fusion amplitude vs the angular momentum l is obtained phenomenologically. A comparison between the model predictions and experiment is made for the following quantities: the total integrated cross sections for production of a fragment with given Z, σ(Z); energy distributions ($d^2\sigma/d\Omega dE$)/sub Z/ at fixed laboratory angle and fragment charge; angular distribution ($d\sigma/d\Omega$)/sub Z/ at fixed fragment charge Z and integrated over energy. The agreement is satisfactory. It is noted that the Z spread observed in this reaction can be described by using only evaporation effects in the highly excited reaction fragments produced in the original inelastic collision.

27917 Large angle scattering of 0.8 GeV protons from ^{12}C. Blanpied, G.S.; Hoffmann, G.W.; Barlett, M.L.; McGill, J.A.; Greene, S.J.; Ray, L.; Van Dyck, O.B.; Amann, J.; Thiessen, H.A. (University of South Carolina, Columbia, South Carolina 29208). *Physical Review* [*Section*] *C: Nuclear Physics ;* **23**: No. 6, 2599-2605(Jun 1981).

Experimental elastic and inelastic angular distributions for 0.8 GeV p+ ^{12}C are reported for momentum transfers up to q = 7.1 fm^{-1}. At the largest angle the elastic cross section is ~2.0 x 10^{-8} mb/sr. The data are analyzed using the distorted-wave Born approximation and the coupled-channels formalism, where phenomenologically deformed optical potentials are used in the latter analysis. The multipole moments extracted from the optical potentials are found to be in fair agreement with those of the charge densities as obtained from electron scattering.

27918 ^{12}C and $^{13}C(\pi^+, p)$ reaction at T/sub π/ = 90 and 180 MeV. Anderson, R.E.; Hoeistad, B.; Boudrie, R.L.; Hoffman, E.W.; Macek, R.J.; Morris, C.L.; Thiessen, H.A.; Smith, G.R.; Kaellne, J. (Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Physical Review* [*Section*] *C: Nuclear Physics ;* **23**: No. 6, 2616-2626(Jun 1981).

The (π^+, p) reaction has been studied at T/sub π/ = 90 and 180 MeV on ^{12}C, and at T/sub π/ = 90 and 170 MeV on ^{13}C. The resolution was sufficient to resolve many single levels in the residual nuclei, and angular distributions were obtained between laboratory angles of 10^0 and 115^0. A comparison between the present (π, p) data and existing high-energy (p,d) data in terms of a model assuming intermediate pion exchange in the (p,d) reaction indicates that the (π,p) reaction is an important subprocess in the (p,d) reaction. The present data also suggest that pion rescattering is likely to be a fundamental part of the (π, p) reaction mechanism.

27919 Elastic and inelastic scattering of 291-MeV pions by ^9Be, Si, ^{58}Ni, and ^{208}Pb. Geesaman, D.F.; Olmer, C.; Zeidman, B.; Boudrie, R.L.; Blanpied, G.S.; Devereux, M.J.; Burleson, G.R.; Segel, R.E.; Swenson, L.W.; Thiessen, H.A. (Argonne National Laboratory, Argonne, Illinois 60439). Contract W-31-109-ENG-38. *Physical Review* [*Section*] *C: Nuclear Physics ;* **23**: No. 6, 2635-2647(Jun 1981).

Angular distributions for the elastic and inelastic scattering of 291-MeV π^+ and π^- by ^9Be, Si, ^{58}Ni, and ^{208}Pb have been measured. The characteristics of two first-order optical potentials have been investigated, and reasonable agreement with the elastic scattering data has been obtained. Macroscopic distorted-wave impulse approximation calculations of the inelastic scattering with Kisslinger potentials are reasonably successful in reproducing the experimental data. The inelastic scattering results for ^9Be provide evidence for the importance of radial localization effects in pion inelastic scattering.

27920 Energy shift effects in pion-nucleus charge exchange. Polyzou, W.N.; Gibbs, W.R.; Stephenson, G.J. Jr. (Theoretical Division, Los Alamos National Laboratory, University of California, Los Alamos, New Mexico 87545). *Physical Review* [*Section*] *C: Nuclear Physics ;* **23**: No. 6, 2648-2651(Jun 1981).

The effect of the shift of the effective energy of the pion-nucleon amplitude on the pion-nucleus charge exchange due to isospin splitting of the core is investigated. Calculations are done in both plane wave and distorted wave frameworks.

27921 Rotational and vibrational excitations in nuclear molecular spectra. Erb, K.A.; Bromley, D.A. (A. W. Wright Nuclear Structure Laboratory, Yale University, New Haven, Connecticut). Contract DE-AC02-76ER03074. *Physical Review* [*Section*] *C: Nuclear Physics ;* **23**: No. 6, 2781-2784(Jun 1981).

All the available data concerning barrier region resonances in the $^{13}C+^{12}C$ system have been examined within the framework of the molecular symmetry model suggested by Iachello. The model accounts very well for the energies and spins of the observed resonances in terms of vibrational and rotational excitations of a well-defined diatomic molecule.

6514 Nuclear Properties And Reactions, A=20-38

REFER ALSO TO CITATION(S) 27919

27922 Fusion of $^{28}Si+^{28}Si$. DiCenzo, S.B.; Petersen, J.F.; Betts, R.R. (A. W. Wright Nuclear Structure Laboratory, Yale University, New Haven, Connecticut 06511). Contract W-31-109-ENG-38. *Physical Review* [*Section*] *C: Nuclear Physics ;* **23**: No. 6, 2561-2570(Jun 1981).

The energy dependence of the fusion cross section for $^{28}Si+^{28}Si$ has been studied over the bombarding energy range 80—140 MeV. The gross features of these cross sections are compared with the expectations of entrance channel models and with the results of time-dependent Hartree Fock calculations. A comparison with similar data for the $^{32}S+^{24}Mg$ and $^{16}O+^{40}Ca$ systems gives results which are not inconsistent with a compound nucleus limitation to fusion at high energies. A search for fusion oscillations similar to those found in lighter systems provides some evidence for their occurrence in the $^{28}Si+^{28}Si$ system.

6515 Nuclear Properties And Reactions, A=39-58

REFER ALSO TO CITATION(S) 27919

27923 New isotope ^{80}Y, and the decays of ^{79}Sr, ^{81}Y, and ^{82}Y. Lister, C.J.; Haustein, P.E.; Alburger, D.E.; Olness, J.W. (Brookhaven National Laboratory, Upton, New York 11973). *Physical Review* [*Section*] *C: Nuclear Physics ;* **24**: No. 1, 260-278(Jul 1981).

The helium-jet recoil transfer technique has been used to study the decays of ^{79}Sr, ^{80}Y, ^{81}Y, and ^{82}Y, produced by $^{58}Ni(^{24}Mg,2pn)$, $^{58}Ni(^{24}Mg,pn)$, $^{58}Ni(^{25}Mg,pn)$, and $^{60}Ni(^{24}Mg,pn)$ reactions, respectively. Decay properties of these four radioactivities have been deduced from the analysis of extensive singles and multiparameter spectroscopic measurements. The low lying level structure of ^{80}Sr, as revealed by the decay of ^{80}Y, can be reproduced through calculations of the interacting-boson-approximation model which place ^{80}Sr at or near the O(6) limit. Positron endpoint measurements [deduced from (β,γ) coincidence studies] have been used to determine decay energies for each of these nuclides. Nuclidic mass excesses inferred from these data show progressively larger deviations from the predictions of currently available mass models for the more neutron-deficient Y isotopes as the N = Z line is approached. It is suggested that this may reflect the influence of nuclear deformation of these isotopes on the mass surface in the vicinity of N = Z = 40.

6516 Nuclear Properties And Reactions, A=59-89

REFER ALSO TO CITATION(S) 27923, 27923

27924 (UCID—19083) Gamma-ray spectra from neutron capture on ^{87}Sr. Sullivan, R.E.; Becker, J.A.; Stelts, M.L. (Lawrence Livermore National Lab., CA (USA); Brookhaven National Lab., Upton, NY (USA)). Jul 1981. Contract W-7405-ENG-48. 17p. NTIS, PC A02/MF A01. Order Number DE81026675.

The gamma-ray spectrum following neutron capture on ^{87}Sr was measured at 3 neutron energies: E/sub n/ = thermal, 2 keV, and 24 keV. Gamma rays were detected in a three-crystal Ge(Li)-NaI-NaI pair spectrometer. Gamma-ray intensities deduced from these spectra by spectral unfolding are presented.

6517 Nuclear Properties And Reactions, A=90-149

27925 (LBL—12792) Continuum gamma-ray spectroscopy. Diamond, R.M. (Lawrence Berkeley Lab., CA (USA)). Jun 1981. Contract W-7405-ENG-48. 42p. (CONF-8106121—1). NTIS, PC A03/MF A01. Order Number DE81025205.

From Conference of the European Physics Society on nuclear and atomic physics with heavy ions; Bucharest, Romania (9 Jun 1981).

When angular momentum is added to a nucleus, it is, of course, carried by the individual nucleons, but two limiting types of behavior may be distinguished: (1) a small number of high-j particles align with the rotation axis and (2) the nucleus is deformed and rotates as a whole. At high spin all nuclei seem to show a compromise utilizing both motions. The excited nuclei left as products of (HI,xn) reactions have so many pathways down that none of the γ-ray transitions have enough intensity to be seen individually until the population gathers near the yrast line. This occurs usually between spin 20 to 40 h-bar. All our information on the higher states comes from their continuum spectra. With the new techniques that are developing, including the use of multiplicity filters, total-energy spectrometers, energy correlation studies, crystal balls, and observation of giant dipole resonances in the continuum spectra, there is hope to learn much about the nature of the high-spin states.

27926 Influence of complex states and deformation on neutron pairing vibrations in the even Sm isotopes. Struble, G.L.; Mann, L.G.; Lanier, R.G.; Buckley, W.M.; Kern, J.; Crawley, G.; Gales, S.; Mueller, D.; Girshick, F. (Lawrence Livermore Laboratory, University of California, Livermore, California 94550). *Physical Review* [*Section*] *C: Nuclear Physics ;* **23**: No. 6, 2447-2458(Jun 1981).

The (p,t) reaction has been used to study the behavior of two-neutron holes in the even Sm isotopes at high excitation energy. The tritons were analyzed with a counter telescope, quadrupole-dipole-dipole-dipole spectrograph, and an Enge split-pole spectrograph. Both broad and narrow structures are observed at excitation energies above 5 MeV. Some of these can be interpreted in terms of the low-energy structure of ^{142}Sm.

6518 Nuclear Properties And Reactions, A=150-189

27927 Fusion-like reactions of ^{16}O with ^{154}Sm: γ-ray multiplicity versus bombarding energy. Beene, J.R.; Halbert, M.L.; Hensley, D.C.; Dayras, R.A.; Young, K.G.; Sarantites, D.G.; Barker, J.H. (Physics Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Physical Review* [*Section*] *C: Nuclear Physics ;* **23**: No. 6, 2463-2478(Jun 1981).

The cross section and average γ-ray multiplicity <M> were measured for reactions of ^{16}O+^{154}Sm leading to specific xn and αxn final channels at five ^{16}O energies from 111 to 168 MeV. For the 6n, 7n, and 8n channels the cross sections show nonstatistical tails and <M> saturates at high energies, indicating that emission of one or more fast neutrons is occurring. The <M> data suggest that the partial waves involved in this nonstatistical behavior are predominantly peripheral. Consideration of all available <M> data from this and other systems indicates that a strong correlation exists between the structure of the projectile and the first appearance of nonstatistical emission of neutrons and alpha particles. The generalized critical angular momentum model of incomplete fusion is extended, providing successful predictions for all data of the energy at which nonstatistical neutron emission sets in and of the energy variation of <M> in the various xn exit channels.

27928 Nonequilibrium emission of neutrons from fusion-like reactions of 152-MeV ^{16}O with ^{154}Sm. Young, K.G.; Sarantites, D.G.; Beene, J.R.; Halbert, M.L.; Hensley, D.C.; Dayras, R.A.; Barker, J.H. (Department of Chemistry, Washington University, St. Louis, Missouri 63130). *Physical Review* [*Section*] *C: Nuclear Physics ;* **23**: No. 6, 2479-2491(Jun 1981).

Neutron time-of-flight spectra and angular correlations were obtained in coincidence with γ rays characteristic of the xn (x = 8,9,10) and αxn (x = 7,8) fusion-like products in reactions of 151.9 MeV ^{16}O with ^{154}Sm. The spectra at all angles (20°, 70°, 100°, 151°) clearly indicate the presence of nonequilibrium neutron emission. The energy spectra can be represented in terms of isotropic emission in the rest frames of two moving sources. The slower of these moves with the speed of the center of mass; its emission corresponds to a temperature of ~1.7 MeV. The faster source, characterized by a temperature of 5 to 6 MeV, has a velocity of ~0.4 of that corresponding to the projectile energy above the Coulomb barrier. The yield of fast neutrons as a function of the exit channel is found to be in good agreement with the predictions of an extended incomplete fusion model. Comparisons are made with other models that lead to emission of fast neutrons.

27929 Test of Axel-Brink predictions by a discrete approach to resonance-averaged (n,γ) spectroscopy. Raman, S.; Shahal, O.; Slaughter, G.G. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Physical Review* [*Section*] *C: Nuclear Physics ;* **23**: No. 6, 2794-2797(Jun 1981).

The limitations imposed by Porter-Thomas fluctuations in the study of primary γ rays following neutron capture have been partly overcome by obtaining individual γ-ray spectra from 48 resonances in the ^{173}Yb(n,γ) reaction and summing them after appropriate normalizations. The resulting average radiation widths (and hence the γ-ray strength function) are in good agreement with the Axel-Brink predictions based on a giant dipole resonance model.

27930 Correlation of aligned angular momentum with scattering angle and energy loss in deeply inelastic collisions. Lazzarini, A.; Metag, V.; Seamster, A.C.; Vandenbosch, R.; Loveman, R. (University of Washington, Seattle, Washington 98195). *Physical Review Letters ;* **46**: No. 15, 988-991(13 Apr 1981).

X-ray out-of-plane anisotropy and multiplicity are determined for the ^{100}Mo+ ^{165}Ho reaction at E/sub c.m./ = 450 MeV. The measurements are made as functions of Q value and θ/sub c.m./ for the coincident quasi or deeply inelastically scattered ions. Strong correlations of the aligned angular momentum with both energy loss and scattering angle are observed.

6519 Nuclear Properties And Reactions, A=190-219

REFER ALSO TO CITATION(S) 27919

27931 Observation of anisotropy in the fission decay of nuclei with vanishing fission barrier. Back, B.B.; Clerc, H.; Betts, R.R.; Glagola, B.G.; Wilkins, B.D. (Chemistry Division, Argonne National Laboratory, Argonne, Illinois 60439). *Physical Review Letters ;* **46**: No. 16, 1068-1071(20 Apr 1981).

Fission angular distributions for nuclei formed by fusion of ^{32}S and ^{197}Au, ^{232}Th, ^{238}U, and ^{248}Cm show an appreciable anisotropy although spherical saddle-point configurations are predicted for these systems by the rotating liquid drop model. The analysis of the data in terms of the statistical model indicates that composite systems of Z = 106, 108, and 112 have been formed with deformations $\beta <$ or $= 0.35$.

6520 Nuclear Properties And Reactions, A=220 And Above

27932 (LA-UR—81-1815) Fertile-to-fissile and fission measurements for depleted uranium bombarded by 800-MeV protons. Russell, G.J.; Gilmore, J.S.; Robinson, H.; Prael, R.E. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36 . 17p. (CONF-8106120—1). NTIS, PC A02/MF A01. Order Number DE81025310.

From 5. meeting of the international collaboration on advanced neutron sources; Julich, F.R. Germany (22 Jun 1981).

Axial distributions of fertile-to-fissile conversions (^{238}U to ^{239}Pu) and fissions have been measured for a thick depleted uranium target bombarded by 800-MeV protons. The ^{239}Pu production was determined by measuring the amount of ^{239}Np produced. The axial distributions were integrated to get the total conversions and fissions occurring in the target. Preliminary experimental results give 3.81 +- 0.19 ^{239}Np atoms produced per incident proton and 5.59 +- 0.56 fissions per incident proton. Corresponding calculated results are 3.46 +- 0.05 and 3.93 +- 0.06. The computations did not include the effects of high-energy fission competition with evaporation. Measured axial disributions of ^{237}U and eleven fission products produced in the target are reported. Preliminary experimental data give 0.95 +- 0.05 ^{237}U atoms made per incident proton.

27933 Effect of a density isomer on high-energy heavy-ion collisions. Nix, J.R.; Strottman, D. (Theoretical Division, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Physical Review* [*Section*] *C: Nuclear Physics ;* **23**: No. 6, 2548-2556(Jun 1981).

On the basis of conventional nuclear fluid dynamics, we study the sensitivity of high-energy heavy-ion collisions to a density isomer in the nuclear equation of state, as well as to a variation in the nuclear compressibility coefficient. Our equation of state is a new functional form which has the property that the speed of sound approaches the speed of light in the limit of infinite compression. The equations of relativistic nuclear fluid dynamics are solved numerically in three spatial dimensions by use of a particle-in-cell finite-difference computing method for the reaction ^{20}Ne+^{238}U at a laboratory bombarding energy per nucleon of 393 MeV. By integrating over the appropriate ranges of impact parameter, we compute the double-differential cross section $d^2\sigma/dEd\Omega$ corresponding both to all impact parameters and to central collisions constituting 15% of the total cross section. To within numerical uncertainties, the results for the various equations of state are very similar to one another except for central collisions at laboratory angle $\theta = 30^0$ and for both central collisions and all impact parameters at $\theta = 150^0$. In these cases, over certain ranges of energy, $d^2\sigma/dEd\Omega$ is larger for the density isomer than for conventional equations of state. The results calculated for all impact parameters are compared with the experimental data of Sandoval et al. for outgoing charged particles.

27934 Electron antineutrino spectrum for ^{235}U(n,f). Dickens, J.K. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). Contract W-7405-ENG-26. *Physical Review Letters ;* **46**: No. 16, 1061-1064(20 Apr 1981).

The nu-bar/sub e/ spectrum has been computed for fission-product decay following a 30-d irradiation of ^{235}U by thermal neutrons. Estimated uncertainties lie in the range (7—15)% for E/sub nu-bar/ <6 MeV. Analysis relied on comparisons of calculated β-ray data with recently obtained experimental β-ray spectra. The nu-bar/sub e/ spectrum is softer than all other calculated nu-bar/sub e/ spectra. Cross sections (10^{-44} cm^2/fission) were calculated as σ(nu-bar/sub e/ +p→n+e$^+$) = 58 +- 3, σ(nu-bar/sub e/ +d→n+p+nu-bar/sub e/) = 2.7 +- 0.2, and σ(nu-bar/sub e/ +d→n+n+e$^+$) = 1.04 +- 0.13.

27935 Determination of the decay channel of the 4d→4f resonance in Tm. Egelhoff, W.F. Jr.; Tibbetts, G.G.; Hecht, M.H.; Lindau, I. (Surface Science Division, National Bureau of Standards, Washington, D.C. 20234). Contract W-7405-ENG-26. *Physical Review Letters ;* **46**: No. 16, 1071-1074(20 Apr 1981).

We have found that the shape of the potential for 4f electrons in Tm predicts quite well the character of the 4d→4f autoionization resonance observed in the photoelectron spectra. The direct photoemission from the 4d shell is suppressed by a barrier in the potential. Tunneling through this barrier is significantly slower than the decay of the excited electron back into the 4d hole. This decay is thus the dominant channel and is observed to lead predominantly to autoionization of the 4f shell.

6530 Nuclear Theory

27936 Pion-nucleus inelastic scattering: Reaction contributions and nuclear spin determinations. Siciliano, E.R.; Walker, G.E. (Meson Physics Division, Los Alamos National Laboratory, Los Alamos, New Mexico 87545). *Physical Review* [*Section*] *C: Nuclear Physics ;* **23**: No. 6, 2661-2682(Jun 1981).

Formulas for pion-nucleus inelastic scattering are presented in a form that may suggest experiments to isolate various contributions to the reaction, including S-wave, P-wave spin and nonspin flip, and effects of nucleon Fermi motion. Adopting a form of the distorted wave impulse appoximation, we obtain an expression for inelastic cross sections that clearly separate the pion laboratory energy (E), three-momentum transfer (q), and scattering angle (θ) dependences. The result is similar to the separation of longitudinal and transverse form factors in inelastic electron scattering. By varying the energy of the incident pion, but working at fixed q, one can determine whether a given nuclear excitation has natural or unnatural parity. By working at fixed θ, and varying E and thus q, one can isolate different reaction contributions: spin, scalar, and "convection current." We also discuss the potential usefulness of studying the energy dependence of angle-integrated differential cross sections at fixed energy loss. The predictions of our formulas are in good agreement with recent data on natural and unnatural parity excitations in $^{12}C(\pi,\pi')^{12}C^*$. Thus, this approach may be useful in analyzing future data in which the final nuclear spin is uncertain. Future experiments with selective q, E, and θ variations to separate nuclear structure from reaction-mechanism uncertainties are suggested.

27937 Hyperstrange hadronic matter. Glendenning, N.K. (Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720). Contract W-7405-ENG-48. *Physical Review* [*Section*] *C: Nuclear Physics ;* **23**: No. 6, 2757-2759(Jun 1981).

The binding energy of hyperstrange matter in the hadronic phase is calculated as a function of strangeness fraction in the mean field approximation to a relativistic field theory of matter. This is compared to a calculation of Chin and Kerman for the quark phase.

27938 Energy dependence of the coupling potentials in (p,n) reactions. Brown, G.E.; Speth, J.; Wambach, J. (NORDITA, DK-2100 Copenhagen O, Denmark). Contract DE-AC02-76ER13001. *Physical Review Letters ;* **46**: No. 16, 1057-1061(20 Apr 1981).

We investigate the physical origin of the energy dependence of the isovector potentials V/sub tau/ and V/sub tausigma/ within a model which includes the one-pion and one-rho exchange potential as well as the second-order effects of the tensor force.

6540 Radiation And Shielding Physics

REFER ALSO TO CITATION(S) 27597

27939 (LA—8869-MS) Neutron production from (α,n) reactions and spontaneous fission in ThO_2, UO_2, and (U,Pu)O_2 fuels. Perry, R.T.; Wilson, W.B. (Los Alamos National Lab., NM (USA)). Jun 1981. Contract W-7405-ENG-36. 35p. NTIS, PC A03/MF A01. Order Number DE81026681.

Available alpha-particle stopping cross-section and ^{17,18}O(α,n) cross-section data were adjusted, fitted, and used in calculating the thick-target neutron production function for alpha particles below 10 MeV in oxide fuels. The spent UO_2 function produced was folded with actinide decay spectra to determine (α,n) neutron production by each of 89 actinides. Spontaneous-fission (SF) neutron production for 40 actinides was calculated as the product of anti ν(SF) and SF branching-fraction values accumulat-

ed or estimated from available data. These contributions and total neutron production in spent UO_2 fuel are tabulated and, when combined with any calculated inventory, describe the spent UO_2 neutron source. All data are tabulated and methodology is described to permit easy extension to specialized problems.

6560 Solid State Physics

REFER ALSO TO CITATION(S) 27355, 27358, 27402

27940 (LA-UR—81-1896) Shock wave physics group (M-6). Morris, C.E. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 6p. (CONF-810684—30). NTIS, PC A02/MF A01. Order Number DE81025340.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

Experimental facilities and activities of the shock wave physics group at LASL are described. The facilities include a compressed gas gun, two-stage gas gun, high explosive facilities, and a pulsed megagauss field facility. (GHT)

27941 Density functional calculation of stopping power of an electron gas for slow ions. Echenique, P.M. (Barcelona Univ. (Spain). Facultad de Fisica); Nieminen, R.M. (Jyvaeskylae Univ. (Finland). Dept. of Physics); Ritchie, R.H. (Oak Ridge National Lab., TN (USA)). *Solid State Communications ;* **37**: No. 10, 779-781(Mar 1981).

The first calculation is described of the stopping power of an electron gas for slow ions using the density-functional formalism. The nonlinear self-consistent potential around the ion is evaluated, and, from scattering theory, the energy loss is determined directly. Comparison with the results of linear theory is made.

27942 Asymptotic decay of correlations in the spin- 1/2 Ising model. Baker, G.A. Jr.; Bessis, D. (Theoretical Division, Los Alamos Scientific Laboratory University of California, Los Alamos, New Mexico 87545). Contract W-7405-ENG.36. *Journal of Mathematical Physics (New York) ;* **22**: No. 6, 1264-1266(Jun 1981).

We show that in the high-temperature region the spin—spin correlation function decays asymptotically like e/sup -kappar//r/ sup b/, 0< or =b< or = (1/2) (d-1).

27943 Infrared and dc conductivity in metals with strong scattering: Nonclassical behavior from a generalized Boltzmann equation containing band-mixing effects. Allen, P.B.; Chakraborty, B. (Department of Physics, State University of New York, Stony Brook, New York 11794). *Physical Review [Section] B: Condensed Matter ;* **23**: No. 10, 4815-4827(15 May 1981).

Metals with high resistivity ($\sim 100\ \mu\Omega$ cm) seem to show weaker variation of resistivity (as a function of temperature and perhaps also static disorder) than predicted by semiclassical (Bloch-Boltzmann) theory (SBT). We argue that the effect is not closely related to Anderson localization, and therefore does not necessarily signify a failure of the independent collision approximation. Instead we propose a failure of the semiclassical acceleration and conduction approximations. A generalization of Boltzmann theory is made which includes quantum (interband) acceleration and conduction, as well as a complete treatment of interband-collision effects (within the independent-collision approximation). The interband terms enhance short-time response to E fields (because the theory satisfies the exact f-sum rule instead of the semiclassical approximation to it). This suggests that the additional conductivity, as expressed phenomenologically by the shunt resistor model, is explained by interband effects. The scattering operator is complex, its imaginary parts being related to energy-band renormalization caused by the disorder. Charge conservation is respected and thermal equilibrium is restored by the collision operator. The theory is formally solved for the leading corrections to SBT, which have the form of a shunt resistor model. At infrared frequencies, the conductivity mostly obeys the Drude law $\sigma(\omega)\sim\sigma(0)(1-i\omega\tau)^{-1}$, except for one term which goes as $(1-i\omega\tau)^{-2}$.

27944 Macroscopic theory of pulsed-laser annealing. II. Dopant diffusion and segregation. Wood, R.F.; Kirkpatrick, J.R.; Giles, G.E. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Physical Review [Section] B: Condensed Matter ;* **23**: No. 10, 5555-5569(15 May 1981).

The radiation from Q-switched ruby and Nd:YAG (yttrium aluminum garnet) lasers can anneal the lattice damage produced by ion implantation of semiconductors. In the first paper of this series, we described the models and methods we have been using for heat-transport calculations during pulsed-laser annealing and gave numerous illustrations of the type of results which are obtained. In this paper, we discuss dopant-diffusion calculations in detail, with particular emphasis on the incorporation of segregation effects into the modeling. From the forms of the experimental dopant profiles, it is established that pulsed-laser annealing is a nonequilibrium process, but in this paper the interface segregation coefficient is treated as an adjustable parameter and no attempt is made to justify the values obtained. Approximate analytical and finite-difference solutions to the diffusion equation are discussed and compared. It is argued here that the excellent fit between theory and experiment which is obtained is a strong indication of the basic validity of the melting model of pulsed-laser annealing.

6561 Superconductivity

27945 (LA-UR—81-941) Hyperfine magnetic field measurements in $ErRh_4B_4$. Cort, G.; Taylor, R.D.; Willis, J.O. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 4p. (CONF-810809—3). NTIS, PC A02/MF A01.

From 16. international conference on low temperature physics; Los Angeles, CA, USA (19 Aug 1981).

Measurements of the hyperfine magnetic field in $ErRh_4B_4$ in zero applied field are reported in a range of temperatures around the reentrant temperature T/sub c2/. Using the Moessbauer effect of ^{57}Fe impurities as a hyperfine field microprobe, the low temperature ferromagnetic order is found to persist well above T/sub c2/ into the superconducting state in this compound, thereby providing direct evidence of coexistence between superconductivity and magnetic order.

27946 (LA-UR—81-1013) Study of $Eu_{1\ 2}Mo_6S_8$ under high pressure and high magnetic field. Huang, C.Y.; Harrison, D.W.; Wolf, S.A.; Fuller, W.W.; Luo, H.L. (Los Alamos National Lab., NM (USA); Naval Research Lab., Washington, DC (USA); California Univ., San Diego, La Jolla (USA)). 1981. Contract W-7405-ENG-36. 3p. (CONF-810809—6). NTIS, PC A02/MF A01.

From 16. international conference on low temperature physics; Los Angeles, CA, USA (19 Aug 1981).

Portions of document are illegible.

The critical field, H/sub c_2/ of $Eu_{1\ 2}Mo_6S_8$, has been measured as a function of pressure and temperature using pressures up to 18 kbar, temperatures from 1.5 K to T/sub c/(~ 10K) and magnetic fields up to 17 T. An extremely anomolous dependence of H/sub c_2/ on pressure from 13 kbar to 18 kbar has been found. A strongly pressure dependent RKKY interaction producing a compensation field at the Mo site is believed responsible for this unusual behavior.

27947 (SAND—81-0838C) High field phase transition in $(TMTSF)_2PF_6$ under pressure. Azevedo, L.J.; Schirber, J.E.; Greene, R.L.; Engler, E.M. (Sandia National Labs., Albuquerque, NM (USA); International Business Machines Corp., San Jose, CA (USA). Research Lab.). 1981. Contract AC04-76DP00789. 4p. (CONF-810809—5). NTIS, PC A02/MF A01.

From 16. international conference on low temperature physics; Los Angeles, CA, USA (19 Aug 1981).

A high field phase transition in the metallic phase of the organic conductor $(TMTSF)_2PF_6$ at low temperatures has been studied by measuring the spin lattice relaxation rate of the methyl group protons. The transition temperature increases with field, is highly pressure dependent and depends on the projection of the magnetic field along the crystalline c axis.

27948 **(SLAC-PUB—2716) Electron-activated carbon diffusion in niobium compounds for RF superconductivity.** Garwin, E.L.; Kirby, R.E.; Hoyt, E.W.; Momose, T. (Stanford Linear Accelerator Center, CA (USA)). Mar 1981. Contract AC03-76SF00515. 14p. (CONF-810495—1). NTIS, PC A02/MF A01. Order Number DE81025128.

From Interdisciplinary surface science conference; Liverpool, UK (6 Apr 1981).

The higher energies planned for the next generation of particle accelerators and storage rings makes the use of superconducting hi-Q RF cavities highly desirable. Past efforts to produce reliable cavities for such projects have met with limited success. Among the barriers to achieving the maximum electric field gradient are oxide layer charging, single surface multipactoring and field emission. These are suface effects. At SLAC, a multi-technique surface analysis system has been constructed to examine possible sources of these problems and to suggest processes or surface coatings which will reduce or eliminate them. As one component of this analysis, we have investigated the time evolution of species on anodized Nb_2O_5-on-Nb surfaces as a function of electron bombardment. The surface concentration of C increases at an anomalously high rate under the exciting electron beam. Examination of the surface and gas phase indicate that the C source is in the underlying material. Estimates of the penetration depth of the beam are in agreement with the fact that there is a significant rate increase in the surface C buildup when the beam penetrates the anodized layer into the Nb bulk. Bulk analytical methods indicate, however, that the C concentration in the Nb is very low. Grain boundary diffusion of C to the surface and/or an enhancement of the C diffusion coefficient due to localized beam pipe heating are examined as possible explanations of this effect.

6570 Theoretical Physics

REFER ALSO TO CITATION(S) 28016

27949 **(CONF-810621—3) Numerical solutions of Navier-Stokes equations.** Yeh, G.T. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 16p. NTIS, PC A02/MF A01. Order Number DE81024118.

From Symposium on fluid mechanics of combustion systems; Boulder, CO, USA (22 Jun 1981).

A unified computational algorithm is developed for numerically solving the Navier-Stokes equations. The algorithm is based on an integrated Compartment Method (ICM). The procedures of ICM are applied to Navier-Stokes equations to set up two systems of algebraic equations describing the spatially discrete velocity and pressure fields. The coefficient matrices are obtained by assembling the link matrices in the same way as in the finite element method (FEM). However, the link matrices are obtained by interpolations for the function and/or its derivatives as in the finite difference approximations. As a result, the ICM algorithm combines the merits of the flexibility of spatial discretization in compartment analyses, of the automatic generation of global matrices in finite element methods, and of the simple interpolation of the function and its derivatives in finite difference approximations. Furthermore, because link matrices are always the 2 x 2 matrices, a unified computer program can be used to study one-, two-, and three-dimensional problems without any modification. The time split scheme is used to solve the resulting systems of equations. It is shown that the scheme yields conditionally stable solutions. Conditions for both linear and nonlinear stabilities are derived. The program is applied to the square cavity problem for demonstrative purposes. Results are compared with those reported by others using finite difference methods and analytical techniques. The agreement is excellent and it shows that the unified algorithm can definitely simulate the behavior of the Navier-Stokes equations.

27950 **(SAND—80-2745C) Heat transfer by conduction and radiation in a one-dimensional planar medium using the differential approximation.** Ratzel, A.C.; Howell, J.R. (Sandia National Labs., Albuquerque, NM (USA); Texas Univ., Austin (USA). Dept. of Mechanical Engineering). 1981. Contract AC04-76DP00789. 28p. (CONF-810804—9). NTIS, PC A03/MF A01. Order Number DE81025998.

From National heat transer conference; Milwaukee, WI, USA (2 Aug 1981).

Portions of document are illegible.

The combined conduction and radiation heat transfer problem for a gray planar medium between two diffuse, isothermal infinite parallel plates is considered using the differential approximation. The P-1 and P-3 spherical harmonics approximations for the intensity distribution are used. In addition, isotropic scattering and uniform volumetric generation terms are included. The governing energy equations developed using the P-1 and P-3 intensity expressions are fourth and sixth order nonlinear ordinary differential equations, respectively, and these equations have been solved numerically using a spline-collocation algorithm. Results are compared with the exact solutions and show that the differential methods are accurate for predicting both temperature profiles and heat transfer rates.

27951 **(SAND—81-2601C) Application of parameter estimation techniques to thermal conductivity probe data reduction.** Koski, J.A.; McVey, D.F. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 25p. (CONF-810683—1). NTIS, PC A02/MF A01. Order Number DE81023746.

From International joint conference on thermophysical properties; Gaithersburg, MD, USA (15 Jun 1981).

Parameter estimation techniques are applied to determine thermal conductivity from line heat source probe data. A data reduction method is described that makes use of experimental temperature data at both early and late times, does not require full development of the classical linear temperature increase versus log-time asymptotic behavior, is not as sensitive to data noise as alternative techniques, and permits evaluation of the experiment design and data assumptions through statistical analysis of final residuals (difference between the analytical solution and experimental data). The approach consists of obtaining a non-linear least squares fit between an analytical solution containing the parameters of interest (conductivity, contact resistance and in some cases density-specific heat product) and experimental data. The method estimates the parameters of the analytical solution from experimental data. The analytical solutions are obtained from the literature. Examination of the sensitivity coefficients (derivatives of the parameters with respect to the measured variable) demonstrates the adequacy of thermal conductivity as a fit parameter. Application of the method to analysis of laboratory and in situ field data are presented for illustrative purposes.

27952 **Quantum dynamical tunneling in bound states.** Davis, M.J.; Heller, E.J. (Department of Chemistry, University of California, Los Angeles, California 90024). *Journal of Chemical Physics ;* **75**: No. 1, 246-254(1 Jul 1981).

Tunneling involves an allowed quantum event which fails to take place classically. Dynamical tunneling is the subset of such events which do not involve a classically insurmountable potential barrier. In this paper, we present unambiguous evidence for dynamical tunneling in bound state quantum systems.The tunneling occurs between two distinct regions of classically trapped quasiperiodic motion. Close analogies are shown to exist between this situation and ordinary barrier penetration in a double minimum potential. In the cases we study, tunneling occurs between equivalent or nearly equivalent local mode motions, which have arisen out of a resonance between the symmetric and nonsymmetric stretch.

27953 **Multipole expansion of stationary asymptotically flat vacuum metrics in general relativity.** Kundu, P. (Department of Physics and Astronomy, University of Rochester, Rochester, New York 14627). *Journal of Mathematical Physics (New York) ;* **22**: No. 6, 1236-1242(Jun 1981).

A multipole expansion scheme is introduced for a wide class of stationary, asymptotically flat, vacuum solutions of Einstein's equations using the conformal techniques of Geroch and Hansen. An intrinsic choice of the conformal factor and suitable asymptotic flatness conditions enable one to express the rescaled gravitational mass and angular momentum potentials and the rescaled spatial metric as power series in normal coordinates around a point Λ representing the spatial infinity on the conformal manifold. The coefficients of this expansion are certain nonlinear combinations of the

Hansen multipole moments. As an example the Schwarzschild metric is discussed in the present framework.

27954 **Transient analysis of Kerr-like phase conjugators using frequency-domain techniques.** Fisher, R.A.; Suydam, B.R.; Feldman, B.J. (University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Physical Review [Section] A: General Physics ;* **23**: No. 6, 3071-3083(Jun 1981).

In this paper we develop the interrelationships between the steady-state and transient behavior for cw-pumped Kerr-like conjugators in which the optical Kerr effect is considered to respond instantaneously. We use Laplace-transform techniques to develop an expression for the conjugate response to input pulses of arbitrary form. For stable conjugator operation (in which the cw conjugate reflectivity is finite for all input frequencies), the expression reduces to an antilinear Fourier-transform relationship, which is readily adaptable to computer simulation. The cw filter function of Pepper and Abrams [Opt. Lett. 3, 312 (1978)] is found to play a central role. We show, both numerically and analytically, that our calculated delta-function response agrees with that previously published. We numerically demonstrate temporal spreading and reshaping when the conjugator transit time becomes equal to or longer than the duration of the input pulse, and we show numerically the perfect chirp reversal for sufficiently thin conjugators and the deviations from perfect chirp reversal upon increasing the thickness of the conjugator. These numerical results can be understood in terms of the bandwidth of the associated cw filter function.

27955 **Free-molecule drag on straight chains of uniform spheres.** Chan, P.; Dahneke, B. (University of Rochester, Rochester, New York 14642). Contract DE-AC02-76EV03490. *Journal of Applied Physics ;* **52**: No. 5, 3106-3110(May 1981).

A numerical technique has been used to determine the free-molecule drag on a straight chain of uniform spheres moving parallel and perpendicular to its axis. For such a concave-shaped body, certain surface elements are inaccessible to molecules having certain velocity components because these areas are screened by neighboring elements. Likewise, reflected molecules do not always escape directly but may experience more than one reflection due to screening by neighboring elements. Because an analytical solution for the drag seems hopelessly complex, we have used a Monte Carlo method to determine the rate of momentum transfer (drag force) due to the molecular collisions and reflections of large numbers of molecules by following their individual dynamics. The results are discussed in terms of the translation of straight chains having fixed orientation, straight chains undergoing Brownian rotations, and branched and kinked chains.

27956 **Statistical mechanics of an exactly integrable system.** Creamer, D.B.; Thacker, H.; Wilkinson, D. (Fermi National Accelerator Laboratory, Batavia, Illinois 60510). *Journal of Mathematical Physics (New York) ;* **22**: No. 5, 1084-1089(May 1981).

The equilibrium thermodynamics of the nonlinear Schroedinger model at finite temperature is calculated by means of the quantum inverse method. Working directly in an infinite volume we derive the equation of state and the integral equation which determines the excitation spectrum. This integral equation is found to be closely related to the Gel/sup ,/fand—Levitan expression for the charge density operator.

6580 Mathematical Physics

REFER ALSO TO CITATION(S) 27949

27957 **(LA—8813-MS) Higher-order terms in sensitivity analysis through a differential approach.** Dubi, A.; Dudziak, D.J. (Los Alamos National Lab., NM (USA)). Jun 1981. Contract W-7405-ENG-36. 23p. NTIS, PC A02/MF A01. Order Number DE81026685.

A differential approach to sensitivity analysis has been developed that eliminates some difficulties existing in previous work. The new development leads to simple explicit expressions for the first-order perturbation as well as any higher-order terms. The higher-order terms are dependent only on differentials of the transport operator, the unperturbed flux, the adjoint flux, and the unperturbed Green's function of the system.

70 FUSION ENERGY

7001 Plasma Research

REFER ALSO TO CITATION(S) 28009

27958 **(CONF-810364—2) Particle ring fusion.** Sudan, R.N. (Cornell Univ., Ithaca, NY (USA). Lab. of Plasma Studies). Apr 1981. Contract AS02-77ET53005. 20p. NTIS, PC A02/MF A01. Order Number DE81023133.

From International school of fusion reactor technology's course on unconventional approaches to fusion; Erice, Italy (16 Mar 1981).

This discussion covers the following four topics: (1) ring equilibria, (2) basic energy balance for fusion power output, (3) magnetic compression of rings, and (4) injection and formation of rings. (MOW)

27959 **(DOE/ET/53004—20) Advanced development of particle-beam-probe diagnostic systems. Technical progress report, 1 July 1980-30 April 1981.** Hickok, R.L.; Jennings, W.C.; Woo, J.T.; Connor, K.A. (Rensselaer Polytechnic Inst., Troy, NY (USA)). May 1981. Contract AS02-76ET53004. 93p. NTIS, PC A05/MF A01. Order Number DE81024427.

The heavy ion beam probe system on the RENTOR tokamak has been reinstalled with considerably improved performance. The heavy neutral beam probe system on the ALEX baseball facility has demonstrated the capability of measuring space potential in minimum-B geometry. A large amount of data were obtained from the highly successful TMX beam probe system and are presently being analyzed. Technological improvements were made on both the RENTOR and ALEX diagnostic systems, new ion sources and extraction configurations were investigated, and the superiority of off-line processing techniques for beam probe data has been demonstrated. The development of high energy probing beams for application to major confinement experiments has been initiated and cross-over sweep systems to improve spatial resolution, differential pumping, and reduce energy requirements have been designed.

27960 **(DOE/ET/53088—20) Rigorously diffusive deterministic map.** Cary, J.R.; Meiss, J.D. (Texas Univ., Austin (USA). Fusion Research Center). Jun 1981. Contract FG05-80ET53088. 21p. (IFSR—25). NTIS, PC A02/MF A01. Order Number DE81023970.

The statistical properties of periodic impulse maps may be obtained from the characteristic functions. Series representations for the characteristic functions, the force correlations, and the momentum diffusion coefficient are presented. These results are applied to the sawtooth map for integer values of the perturbation parameter ϵ, in which case the series may be summed explicitly. It is found that the diffusion coefficient has the quasilinear value for chemical bond ϵ + 2chemical bond $\geqq$ 2, it vanishes for $\epsilon = -2$ and $\epsilon = -1$, and it is infinite for $\epsilon = -3$.

27961 **(GA-A—15172) Density limit in tokamaks.** Ohyabu, N. (General Atomic Co., San Diego, CA (USA)). Mar 1979. Contract AT03-76ET51011. 23p. NTIS, PC A02/MF A01. Order Number DE81024358.

From a condition for thermal stability of the plasma boundary in tokamaks, an upper limit on the density which is consistent with the experimental observations has been derived.

27962 **(GA-A—16140) Doppler ion program description.** Henline, P. (General Atomic Co., San Diego, CA (USA)). Dec 1980. Contract AT03-76ET51011. 65p. NTIS, PC A04/MF A01. Order Number DE81025514.

The Doppler spectrometer is a conventional Czerny-Turner grating spectrometer with a 1024 channel multiple detector. Light

is dispersed across the detector, and its output yields a spectrum covering approximately 200 A. The width of the spectral peak is directly proportional to the temperature of the emitting ions, and determination of the impurity ion temperature allows one to infer the plasma ion temperature. The Doppler ion software system developed at General Atomic uses a TRACOR Northern 1710-31 and an LSI-11/2. The exact configuration of Doublet III is different from TRACOR Northern systems at other facilities.

27963 **Gas emission from chamber walls.** Dolan, T.J. (Oak Ridge National Lab., TN (USA). Fusion Energy Div.). *Journal of Nuclear Materials ;* **92**: No. 1, 112-120(Aug 1980).

The neutral gas concentration in the chamber wall of a plasma experiment is described by a one-dimensional diffusion equation in the wall with a nonlinear boundary condition relating to gas emission rates. The equation is transformed to an integral equation, which is solved analytically for short and long times and also numerically. Chamber pressure rise during and after plasma decay is compared with experimental data.

27964 **(NRL—8482) Injection of intense pulsed-ion beams into tokamaks with application to plasma heating and current maintenance.** Manheimer, W.M.; Winsor, N.K. (Naval Research Lab., Washington, DC (USA)). 24 Jun 1981. Contract AI01-76ET53020. 19p. NTIS, PC A02/MF A01. Order Number DE81025569.

This report examines various schemes by which an intense pulsed ion beam can be injected into a tokamak. There are several schemes which appear to be viable just as the plasma is being formed, but which cannot work for a steady state plasma. All schemes considered here use parallel injection. Once the beam is in the plasma, the heating and current maintenance are calculated. It is found that intense pulsed beams with reasonable energy should be capable of heating the plasma to breakeven and ignition.

27965 **(PPPL—1794) High energy runaway electron transport deduced from photonuclear activation of the PLT limiter.** Barnes, C.W.; Stavely, J.M. Jr.; Strachan, J.D. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1981. Contract AM02-76CH03073. 17p. NTIS, PC A02/MF A01. Order Number DE81025898.

In large tokamaks, runaway electrons may be accelerated up to energies over 20 MeV by the toroidal electric field. When these particles leave the plasma, they impact the material limiters and emit bremsstrahlung hard x-rays. This bremsstrahlung may cause photonuclear reactions in the limiter, leaving radioisotopes behind. Both the amount of activation and its spatial distribution on the limiter provide information on the confinement of high energy electrons. The stainless steel poloidal ring limiter from the Princeton Large Torus has been analyzed and six observable photonuclear reactions with energy thresholds have been found for the reactions varying from 8 to 23 MeV. The amount of activation from each reaction determines the average number of runaway electrons above each activation threshold energy. The inferred runaway electron population decreases exponentially with energy as exp (-E/3.2 MeV) implying an energetic runaway electron confinement time of 50 to 80 msec. The poloidal variation of the activation can be described by a 0.02 cm scrape-off layer step size which implies about a 90 msec confinement time.

27966 **(PPPL—1802) Renormalized Lie perturbation theory.** Rosengaus, E.; Dewar, R.L. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1981. Contract AM02-76CH03073. 33p. NTIS, PC A03/MF A01. Order Number DE81025899.

A Lie operator method for constructing action-angle transformations continuously connected to the identity is developed for area preserving mappings. By a simple change of variable from action to angular frequency a perturbation expansion is obtained in which the small denominators have been renormalized. The method is shown to lead to the same series as the Lagrangian perturbation method of Greene and Percival, which converges on KAM surfaces. The method is not superconvergent, but yields simple recursion relations which allow automatic algebraic manipulation techniques to be used to develop the series to high order. It is argued that the operator method can be justified by analytically continuing from the complex angular frequency plane onto the real line. The resulting picture is one where preserved primary KAM surfaces are continuously connected to one another.

27967 **(PPPL—1805) Turbulent polarization terms and Balescu-Lenard operator.** Krommes, J.A.; Kotschenreuther, M. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1981. Contract AM02-76CH03073. 24p. NTIS, PC A02/MF A01. Order Number DE81025896.

Certain unfamiliar terms in renormalized plasma turbulence theory are interpreted in terms of the familiar physics of the Balescu-Lenard collision operator. Specifically, it is argued that the so-called polarization parts of the operator which renormalizes the particle propagator are related to fluctuations of the Fokker-Planck coefficient which describes polarization drag, and to fluctuations of the effective dielectric function of the medium.

27968 **(PPPL—1810) Analytical theory of interchange and compressional Alfven instabilities in EBT.** Cheng, C.Z.; Tsang, K.T. (Princeton Univ., NJ (USA). Plasma Physics Lab.; Oak Ridge National Lab., TN (USA)). Jul 1981. Contract AM02-76CH03073. 19p. NTIS, PC A02/MF A01. Order Number DE81025900.

The local stability of the EBT plasma is analyzed for the long wavelength perturbations in the frequency regime, $\omega \sim \leqq \Omega/$ sub i/(Ω/sub i/ is ion cyclotron frequency). In addition to the low frequency interchange instability, the plasma can be unstable to the compressional Alfven wave. Contrary to the previously obtained quadratic dispersion relation in ω for the interchange mode, our dispersion relations for both types of instabilities are cubic in ω. New stability boundaries are found, for the hot electron interchange mode, to relate to the enhanced compressibility of the core plasma in the presence of hot electrons. The compressional Alfven instability is driven due to the coupling of hot electron magnetic drifts and diamagnetic drift with the compressional Alfven wave. The stability conditions of these two types of instabilities are opposite to each other.

27969 **(PPPL—1811) Scattering of lower-hybrid waves by density fluctuations.** Andrews, P.L.; Perkins, F.W. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1981. Contract AM02-76CH03073. 23p. NTIS, PC A02/MF A01. Order Number DE81025706.

The investigation of the scattering of lower-hybrid waves by density fluctuations in tokamaks is distinguished by the presence in the wave equation of a large, random, derivative-coupling term. Assuming the fluctuations to be of long wavelength compared to the incident wave the similarity of the wave equation to the Schroedinger equation for a particle in a random magnetic field is used to derive a two-way diffusion equation for the wave energy density. The diffusion constant found disagrees with earlier findings and the source of the discrepancy is pointed out. When the correct boundary conditions are imposed this equation can be solved by separation of variables. However most of the important features of the solution are apparent without detailed algebra.

27970 **(PPPL—1813) Central helium density measurements in PLT.** Chrien, R.E.; Eubank, H.P.; Meade, D.M.; Strachan, J.D. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1981. Contract AM02-76CH03073. 16p. NTIS, PC A02/MF A01. Order Number DE81025897.

The central helium density in PLT has been deduced from measurements of the ratio of d-^{3}He to d-d fusion reactions during deuterium neutral beam injection. The inward transport time for ^{3}He puffed at the edge plasma was 10 → 30 msec. The decay time of the central ^{3}He density increased with electron density, varying from 0.3 sec to greater than 1.0 sec over the density range of (1 → 5) x 10^{13} cm^{-3}.

27971 (UCAR—10060-80-4, pp 1-10) **Applied plasma physics.** 12 Mar 1981. NTIS, PC A04/MF A01.

In Mirror fusion. Quarterly report, October-December 1980.

Applied Plasma Physics is a major sub-organizational unit of the Magnetic Fusion Energy (MFE) Program. Within this unit are Fusion Plasma Theory, Experimental Plasma Research, and the Na-

tional MFE Computer Network. Fusion Plasma Theory encompasses the work of the Fusion Plasma Theory and Computation group and the MFE Computer Center (MFECC) Computational Physics group. The first group has the responsibility for developing theoretical-computational models in the general areas of plasma properties, equilibrium, stability, transport, and atomic physics, specifically for the LLNL mirror experimental program. The MFECC Computational Physics group serves the entire MFE community. Its principal objective is to develop detailed numerical models for investigating plasma phenomena and for simulating present and future magnetic confinement systems, with applications to tokamaks, mirrors, and various alternate concepts. Under Experimental Plasma Research, we are studying the feasibility of using certain neutron-detection techniques as plasma diagnostics in the next generation of thermonuclear experiments.

27972 (UCAR—10060-80-4, pp 11-27) **Confinement systems.** 12 Mar 1981. NTIS, PC A04/MF A01.

In Mirror fusion. Quarterly report, October-December 1980.

Lawrence Livermore National Laboratory (LLNL) has primary national responsibility for magnetic-mirror programs, an approach pioneered here since the early 1950's. A goal of LLNL's Magnetic Fusion Energy (MFE) Program is to provide the technology to develop a continuously operating fusion reactor. The heart of this reactor will be a plasma confined by magnetic-mirror geometry and continuously sustained by injection of beams of energetic neutral atoms (such as deuterium). Two confinement systems are now in operation at LLNL; the Beta II (formerly 2XIIB), and the Tandem Mirror Experiment (TMX). Beta II is a simple-cell mirror machine. In 1979, work was begun on development of a magnetized, coaxial plasma gun to be used for the startup phase of a field-reversed mirror. The closed field lines of the field-reversed mirror should result in improved plasma confinement compared to that in the standard mirror with open lines. In 1976, we proposed a new idea: the tandem-mirror concept. A tandem mirror reactor would contain a long solenoidal magnet terminated at both ends by conventional mirror cells. These cells would act as end plugs to prevent plasma leakage out the ends of the solenoid. TMX has been constructed to test the principles of this concept. At the end of September 1980, TMX was shut down to permit the construction of an improved tandem mirror, TMX Upgrade. The construction is scheduled for completion by November 1981.

27973 (UCAR—10060-80-4, pp 32-58) **Mirror Fusion Test Facility.** 12 Mar 1981. NTIS, PC A04/MF A01.

In Mirror fusion. Quarterly report, October-December 1980.

The Mirror Fusion Test Facility (MFTF) now being constructed will bridge the gap between present-day small mirror experiments and future fusion-reactor activity based on magnetic mirrors, e.g., an experimental fusion reactor planned for operation by 1990. In MFTF, we shall investigate advanced engineering problems such as those associated with superconducting magnets (MFTF uses a superconducting magnet of yin-yang design that will be capable of continuous operation), neutral-beam injectors, plasma-wall interactions, the disposal of neutral particles and ions escaping from the plasma chamber, and high-speed vacuum-pumping techniques.

27974 **Hot-electron production with multiple-frequency illumination.** Speziale, T. (KMS Fusion, Inc., P. O. Box 1567, Ann Arbor, Michigan 48106). Contract DE-AC08-78DP40030. *Physical Review* [*Section*] *A: General Physics ;* **23**: No. 6, 3332-3334(Jun 1981).

The use of multiple-frequency illumination is shown to be capable of reducing the energy of suprathermal electrons produced in the laser-plasma interaction. The range of the suprathermal electrons is shown to vary inversely with the number of spectral components.

27975 **Measurements of the plasma ablated from an end plug in a high-energy θ pinch.** Ekdahl, C.A.; Commisso, R.J.; McKenna, K.F. (Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87544). Contract W-7405-ENG. 36. *Journal of Applied Physics ;* **52**: No. 5, 3245-3248(May 1981).

A ruby-laser double-exposure holographic interferometer was used to study the interaction of a θ-pinch-generated, hot, dense-plasma column (T/sub e/+T/sub i/ ~2—3 keV, n~10^{16} cm^{-3}) with solid end plugs inserted to eliminate axial loss of plasma. Radial density profiles showing a peak density on axis of greater than 10^{16} cm^{-3} near the plug surface were obtained by Abel inversion of the interferograms. Interferograms showed substantial differences in the density profiles for different plug materials. Strong absorption of the laser light by the Stark-broadened Nii line at 6942 A was used to estimate the ablated plasma temperature.

27976 **Laser-initiated channels for ion transport: CO_2-laser absorption and heating of NH_3 and C_2H_4 gases.** Olsen, J.N. (Sandia National Laboratories, Albuquerque, NM 87185). Contract DE-AC04-76-DP00789. *Journal of Applied Physics ;* **52**: No. 5, 3279-3285(May 1981).

Initiation and guiding of an electrical discharge by CO_2-laser heating of a molecular gas can provide a channel suitable for the transport of a light ion beam for inertial-confinement fusion. We report absorption measurements for a CO_2 laser tuned to the molecular vibrations of NH_3 and C_2H_4 as a function of gas pressure, laser frequency, and laser energy density. The SATUR laser-gas-interaction code models the details of the absorption saturation process for NH_3, calculating gas temperature in the process. The calculation is normalized to absorption data at 0.04 J/cm^2 and tested with transmission measurements up to 15 J/cm^2 into a 50-cm cell. These calculations are the basis for understanding the electrical breakdown and discharge evolution as observed and simulated in the following report. Of particular importance is the calculation of gas temperature of 1900—2100 °K for 15—35-J/cm^2 incident laser energy density.

27977 **Laser-initiated channels for ion transport: breakdown and channel evolution.** Olsen, J.N.; Baker, L. (Sandia National Laboratories, Albuquerque, NM 87185). Contract DE-AC04-76-DP00789. *Journal of Applied Physics ;* **52**: No. 5, 3286-3292(May 1981).

The electrical breakdown and discharge evolution in CO_2 laser-heated molecular gases has been studied. With the laser tuned to a vibrational mode of NH_3, C_2H_4, CH_2CHCN, or CH_3OH the breakdown potential decreases as much as 10-fold for laser pulse energies up to 35 J/cm^2. The subsequent 50—142-cm discharges are straight, stable, and reproducible. Analogous tests in D_2 and air yield only a small alteration of breakdown potential and do not cause a straight discharge. The expansion of the initial laser-heated gas has been modeled by the CHARTB hydrocode with the addition of the NH_3 equation of state in tabular and analytic form to that code. The breakdown characteristics and initial expansion stage confirm the earlier calculation of laser heating to 1900—2100 °K. Experimental observations of the discharge evolution in NH_3 have measured (1) the radial expansion velocity by streak-camera photography of the H/sub β/ emission zone, (2) the plasma temperature by the Niv/Niii line-ratio method, and (3) the electron-density profile by holographic interferometry. The central zone of the channel is heated to 5.5 eV and expands with a radial velocity of 1.0—1.2 mm/μs for the case of a 27-kA discharge in 20 Torr of NH_3. Preliminary hydrocode simulations of the discharge show qualitative agreement with observations.

27978 **Nonlinear destabilization of tearing modes.** Carreras, B.A.; Rosenbluth, M.N.; Hicks, H.R. (Institute for Advanced Study, Princeton, New Jersey 08540). Contract DE-AC02-76ET-53011 AND W-7405-ENG-26. *Physical Review Letters ;* **46**: No. 17, 1131-1134(27 Apr 1981).

We have studied the effect of a background of many modes on the growth of a tearing mode. A third-order calculation with random phase approximation is presented for a static background. In that case, the tearing mode is further destabilized (stabilized) if the Δ' values of the nonlinearly driven modes are positive (negative). This explains the destabilization of the ($m = 3$; $n = 2$) tearing mode observed in nonlinear three-dimensional calculations.

27979 **Linearized 3D hybrid code for stability studies of field-reversed ion rings.** Friedman, A.; Sudan, R.N.; Denavit, J. (Laboratory of Plasma Studies, Cornell University, Ithaca, New York 14853). Contract EY-76-5-02-3170;EY-76-5-02-22. *Journal of Computational Physics ;* **39**: No. 3, 1-35(1 Mar 1981).

A linearized 3D hybrid code, RINGHYBIRD, for the study of the low-frequency stability of high-beta equilibria is described. In particular, this code is suitable for application to field-reversed ion rings and mirror plasmas. The code models the development in time of perturbations having a specified azimuthal mode number, l, having about an axisymmetric equilibrium state. The equilibrium current is purely azimuthal and is carried entirely by the energetic ion component, which is modeled by discrete simulation particles. This current is consistent with the equilibrium magnetic field and hot-component charge density. In addition to the hot-ion component, a cold uniform density background of ions and a complement of massless electrons are described by fluid equations which incorporate a scalar resistivity. Also presented are verifications of code performance, including tests of cold-plasma normal modes and of plasma return currents arising in response to an azimuthal "drive" current rising linearly with time.

27980 **ANTIC: A code for calculation of neutral transport in cylindrical plasmas.** Tamor, S. (Laboratory for Applied Plasma Studies, Science Applications, Inc. La Jolla, California 92037). Contract DE-AC03-79ET53057. *Journal of Computational Physics ;* **39**: No. 3, 104-119(1 Mar 1981).

A scheme for computing the steady state transport of neutral atoms cylindrical plasmas is described. The physical model used represents atoms emerging from charge exchange collisions by an isotropic source of neutrals with energy equal to 3/2 times the local ion temperature. The process of charge exchange and impact ionization by electrons and ions are included. The transport can be described by an integral equation for the neutral source density, and this equation approximated by a set of algebraic equations for the zone average source densities. A derivation of the appropriate kernel and a technique for computing it are presented. Comparison of computed results with predictions of other, more exact, codes exhibit quite satisfactory agreement for temperatures as high as 10 keV.

27981 **Fluid simulation of ion pressure gradient driven drift modes.** Horton, W.; Estes, R.D. (Texas Univ., Austin (USA). Fusion Research Center); Biskamp, D. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)). *Plasma Physics ;* **22**: No. 7, 663-678(Jul 1980).

The nonlinear evolution of the ion pressure gradient driven drift wave instability is investigated through three-dimensional fluid simulations. The anomalous thermal transport produced in the saturated state is reported as a function of the system parameters.

27982 **Stellarator equations of motion.** Strauss, H.R. (Texas Univ., Austin (USA). Fusion Research Center). *Plasma Physics ;* **22**: No. 7, 733-745(Jul 1980).

Nonlinear reduced equations are derived for stellarators on the standard low beta, large aspect ratio epsilonsup(1/2) ordering. Previous equations describing equilibrium and stability are recovered. The reduced equations make nonlinear hydromagnetic computations much more tractable.

27983 **Preliminary experimental observations of turbulent thermal insulation.** Jones, R. (Plasma Physics Research Lab., Colonia, NJ (USA)). *Plasma Physics ;* **22**: No. 7, 753-756(Jul 1980).

Ion waves are used to introduce an anomalous resistivity and decrease the electron thermal conduction losses from an open cylindrical magnetoplasma device.

27984 **Debye shielding corrections to one and two photon bremsstrahlung.** Grabbe, C.L. (Science Applications, Inc., McLean, VA (USA)). *Plasma Physics ;* **22**: No. 7, 785-786(Jul 1980).

Brief note.

7002 Fusion Power Plant Technology

REFER ALSO TO CITATION(S) 27356, 27974

27985 **(CONF-800980—41) Safety of superconducting magnets for fusion: thermal analysis of large cryostable magnets.** Turner, L.R. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 6p. NTIS, PC A02/MF A01. Order Number DE81023886.

From Applied superconductivity conference; Santa Fe, NM, USA (29 Sep 1980).

A thermal analysis program has been developed to study the response of a cryostable fusion magnet to abnormal conditions such as a localized heat input, overcurrent, or uncooled length of conductor. It performs a heat balance on each element. Variation of parameters with temperature, pressure, and magnetic field are incorporated. The program has been applied to a conductor with magnetic field variation along its length, carrying a high current as might occur in one toroidal field coil when a neighboring coil discharges rapidly. It is found that a stable normal region can develop, with possibly serious consequences.

27986 **(CONF-800980—44) Development of a pulsed cable test facility for superconducting ohmic heating coils.** Kim, S.H.; Smith, R.P.; Kustom, R.L.; Praeg, W.F.; Krieger, C.I. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 5p. NTIS, PC A02/MF A01. Order Number DE81023920.

From Applied superconductivity conference; Santa Fe, NM, USA (29 Sep 1980).

This paper describes a Pulsed Cable Test Facility (PCTF) under development at Argonne National Laboratory (ANL). Its essential part is a pulsed superconducting split coil. The inner and outer diameters of the coil will be 45.1 cm and 88.3 cm, respectively, with an adjustable gap between the two halves of the coil. At a peak current of 11 kA, the coil will store an energy of 3.5 MJ and produce a magnetic field of 6.4 T. Using a 7 MW pulsed (2.9 MW rms) power supply, the PCTF coil will produce field change of 6 T/s. With the addition of a solid state switch to the system, dB/dt values of up to 24 T/s can be obtained. Pancake coils, wound with developmental cables, will be placed in the adjustable gap of the PCTF coil and be tested at up to 50 kA furnished by a separate power supply. The PCTF cryogenic facilities include a non-metallic cryostat and a helium liquefier.

27987 **(CONF-810665—1) Research and development on coatings in APEX at Argonne National Laboratory.** Gruen, D.M.; Kaminsky, M.; Norem, J.; Pelling, M.J.; Young, C.E. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 11p. NTIS, PC A02/MF A01. Order Number DE81023549.

From Plasma-materials development workshop; Albuquerque, NM, USA (24 Jun 1981).

Work is reported on testing and development of coatings, development of laser-induced fluorescence as a quantitative detection technique for impurity atoms, and optimization of plasma parameters in the APEX tokamak. (MOW)

27988 **(CONF-810812—14) Recovery of magnetic energy in an MPR expansion chamber.** Olson, R.E.; Miley, G.H. (Illinois Univ., Urbana (USA). Fusion Studies Lab.). 1981. Contract AS02-76ET52040. 4p. (COO—2218-202). NTIS, PC A02/MF A01.

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

The technique of magnetic coupling for measurements of charged particles from Moving Plasmoid Reactors is described. A model is developed to calculate the magnitude of and the recovery efficiency of magnetic energy leftover in the MPR. Some estimates and observations are also made concerning the possible plasmoid velocities and power output in the expansion chamber system. (MOW)

27989 **(CONF-8008108—1) Coatings and claddings for the reduction of plasma contamination and surface erosion in fusion reactors.** Kaminsky, M. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 26p. NTIS, PC A03/MF A01. Order Number DE81023108.

From International symposium on physics of ionized gases; Dubrovnik, Yugoslavia (23 Aug 1980).

For the successful operation of plasma devices and future fusion reactors it is necessary to control plasma impurity release and surface erosion. Effective methods to obtain such controls include the application of protective coatings to, and the use of clad materials for, certain first wall components. Major features of the development programs for coatings and claddings for fusion applications will be described together with an outline of the testing program. A discussion of some pertinent test results will be included.

27990 **(DOE/ET/52015—T16) Helium generation in fusion reactor materials. Progress report, October-December 1980.** Kneff, D.W.; Farrar, H. IV. (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). 14 Jan 1981. Contract AT03-76ET52015. 6p. NTIS, PC A02/MF A01. Order Number DE81022987.

Helium analyses have been initiated for the helium accumulation dosimetry materials irradiated in the neutron characterization experiment at RTNS-II. Analyses of the separated isotopes of molybdenum irradiated in the RTNS-I, RTNS-II, and Be(d,n) neutron fields are in progress. The emphasis during the present period was on improving the gas mass spectrometer sensitivity for these samples.

27991 **(DOE/ID/01570—T22) Heating calculations of fusion blanket experiments in a fission reactor.** Wessol, D.E.; Judd, J.L.; Scott, A.J.; Bohn, T.S. (EG and G Idaho, Inc., Idaho Falls (USA)). Dec 1980. Contract AC07-76ID01570. 6p. NTIS, PC A02/MF A01. Order Number DE81026020.

It has been proposed that testing fusion first wall/blanket/shield (FW/B/S) components in a fission reactor could provide timely solutions to some engineering problems that should be solved before the next generation of fusion reactors such as FED and INTOR can be built and operated reliably. It was earlier demonstrated that bulk heating rates in fusion FW/B/S could be simulated in the Engineering Test Reactor (ETR) at the Idaho National Engineering Laboratory thus making integral thermal-hydraulic and cooling systems testing feasible in certain existing fission reactors. This paper extends these results by describing the calculations in some detail and comparing the neutronics of the tokamak FW/B/S with the same system in the ETR.

27992 **(EGG—2106) Fusion Reactor Safety Research program. Annual report, FY-80.** Crocker, J.G.; Cohen, S. (EG and G Idaho, Inc., Idaho Falls (USA)). Jun 1981. Contract AC07-76ID01570. 142p. NTIS, PC A07/MF A01. Order Number DE81027523.

The report is in three sections. Outside contracts includes a report of newly-started study at the General Atomic Company to consider safety implications of low-activation materials, portions of two papers from ongoing work at PNL and ANL, reports of the lithium spill work at HEDL, the LITFIRE code development at MIT, and risk assessment at MIT, all of which are an expansion of FY-79 outside contracts. EG and G Activities includes adaptations of four papers of ongoing work in transient code development, tritium system risk assessment, heat transfer and fluid flow analysis, and fusion safety data base. Program Plan Development includes the Executive Summary of the Plan, which was completed in FY-80, and is accompanied by a list of publications and a brief outline of proposed FY-81 activities to be based on the Program Plan.

27993 **(HEDL-SA—2331-FP) Miniaturized mechanical-property tests for evaluating fusion-reactor materials.** Bauer, R.E.; Puigh, R.J.; Chin, B.A.; Williams, J.C. (Hanford Engineering Development Lab., Richland, WA (USA)). 1981. Contract AC14-76FF02170. 28p. (CONF-810256—1). NTIS, PC A03/MF A01. Order Number DE81024108.

From AIME annual meeting; Chicago, IL, USA (2 Feb 1981).

The effects of the severe irradiation environment of fusion plants on first wall materials are not fully understood. Among the properties which are not well characterized with respect to radiation effects are tensile properties and fatigue crack propagation. This may be especially important because of the high static loads and the superimposed cyclic loading on the first wall. At present, there is very little data on the effects of irradiation on the tensile and fatigue crack growth characteristics of fusion first-wall alloys. The physical size of standard specimens used to obtain such data are too large to permit irradiation of the number required to successfully characterize these materials. Therefore, miniaturized tensile and center-cracked-tension specimens have been developed to circumvent these difficulties. This talk describes these specimens, the attendent test apparatus, and some preliminary properties which have been obtained.

27994 **(IAEA-CN—38/P-4-1) Argonne heavy-ion fusion program: accelerator demonstration facility (phase zero).** Watson, J.M.; Arnold, R.C.; Bogaty, J.M. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 12p. (CONF-800707—27). NTIS, PC A02/MF A01. Order Number DE81025155.

From 8. international conference on plasma physics and controlled nuclear fusion research; Brussels, Belgium (1 Jul 1980).

The feasibility of the RF linac heavy ion driver for inertial confinement fusion is generally now accepted. However, there are many beam manipulations that are specific to the RF linac HIF driver which must be demonstrated. Accelerator projects have begun at Argonne National Laboratory (ANL) to resolve some of the uncertainties. A minimum program has started which involves demonstration of some critical issues for linacs and accumulator rings (injection, accumulation, extraction, emittance growth, beam lifetime, internal compression, etc.). An improved facility is also proposed which would deposit more than 3 kJ on a 0.5 mm radius spot for interesting energy deposition experiments. The experimental program during the past two years has developed a high intensity xenon source, 1.5 MV preaccelerator, and the initial RF linac cavities for the demonstration projects.

27995 **(LBL—12771) Electron collisional detachment processes for a 250 keV D^- ion beam in a partially ionized hydrogen target.** Savas, S.E. (Lawrence Berkeley Lab., CA (USA)). Sep 1980. Contract W-7405-ENG-48. 166p. NTIS, PC A08/MF A01. Order Number DE81027093.

Thesis.

Neutral atom beams with energies above 200 keV may be required for various purposes in magnetic fusion devices following TFTR, JET and MFTF-B. These beams can be produced much more efficiently by electron detachment from negative ion beams than by electron capture by positive ions. We have investigated the efficiency with which such neutral atoms can be produced by electron detachment in partially ionized hydrogen plasma neutralizers.

27996 **(SAND—80-2788C) Heating of cryogenic targets in a light-ion fusion cavity.** Cook, D.L.; Sweeney, M.A. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 25p. (CONF-810804—3). NTIS, PC A02/MF A01.

From National heat transer conference; Milwaukee, WI, USA (2 Aug 1981).

Survivability of cryogenic targets in single-shot and reactor cavity environments is an essential prerequisite for high gain (> 25) target experimentation, target development, and power production. Heat sources in a gas-filled light ion beam cavity include radiative, convective, and viscous heating by the cavity fill gas, heating due to laser radiation used to initiate low-density plasma channels for beam propagation, and heating due to ohmic dissipation of channel currents near the target. Prior to injection of the target into the cavity, tritium decay and target acceleration are the sources of heat. In this paper the parametric dependence, time scale, and magnitude of each of these thermal sources are discussed. Potential thermal protection techniques which may be applicable to long ($>$ 0.1 s), intermediate ($\sim$ ms), and short-duration ($\sim$ μs) heat loads are described, and remaining concerns are noted.

27997 **(SAND—81-0753C) Power flow for vacuum-insulated inductive loads.** VanDevender, J.P. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 3p. (CONF-810659—10). NTIS, PC A02/MF A01. Order Number DE81023691.

From 3. IEEE international pulsed power conference; Albuquerque, NM, USA (1 Jun 1981).

The transport of power through a vacuum insulator without flashover and through a short, self-magnetically insulated transmis-

sion line without gap shorting severely constrains the stored energy of the inductive load for 30 ns to 300 ns drive times. An electrostatic gap closure mechanism is presented and evaluated. The gap closure constraints are then combined with constraints imposed by magnetic insulation of the electrons from the cathode and by the vacuum insulator flashover to examine the vacuum power flow from a systems point of view. It is concluded that multimegajoule drivers will be multi-megavolt sources.

27998 **(SAND—81-1329C) Investigations of hydrodynamic stability using electron and ion beams.** Perry, F.C. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 10p. (CONF-810684—20). NTIS, PC A02/MF A01. Order Number DE81023175.

From APS conference on shock waves in condensed matter; Menlo Park, CA, USA (23 Jun 1981).

Intense electron and ion beams are being used to study hydrodynamic stability at the terrawatt level. These investigations support the target design and beam focusing efforts for the particle beam fusion accelerators PBFA I and II. Both shock accelerated and ablatively accelerated perturbation growth and convergence effects have been observed and compared with calculations.

27999 **(SAND—81-1382C) Two-dimensional, time-dependent theory of magnetically insulated electron flow.** Seidel, D.B.; Mendel, C.W. Jr.; Slutz, S.A.; Neau, E.L. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 4p. (CONF-810659—11). NTIS, PC A02/MF A01. Order Number DE81023690.

From 3. IEEE international pulsed power conference; Albuquerque, NM, USA (1 Jun 1981).

Magnetic insulation has provided a means of exceeding the limitations on power flow density imposed by material insulator breakdown. Particle beam fusion is just one of many possible applications of this important phenomenon. In this paper, an earlier 1-D theory for magnetically insulated electron flow has been extended to treat problems with gradual variations in time and a second spatial dimension. The flow is self-consistently specified by a distribution function of electron energy and canonical momentum which varies in space and time. The electron Hamiltonian and a phase space continuity equation are presented. An example is given which provides useful insights into the physics of insulated flow.

28000 **(UCAR—10060-80-4) Mirror fusion. Quarterly report, October-December 1980.** Harrison, M.A.; McGregor, C.K. (eds.). (Lawrence Livermore National Lab., CA (USA)). 12 Mar 1981. Contract W-7405-ENG-48. 72p. NTIS, PC A04/MF A01. Order Number DE81025494.

Separate abstracts were prepared for each of the 4 included sections. (MOW)

28001 (UCAR—10060-80-4, pp 28-31) **Development and technology.** 12 Mar 1981. NTIS, PC A04/MF A01.

In Mirror fusion. Quarterly report, October-December 1980.

The Development and Technology Program is aimed at developing the technology required for carrying out the magnetic fusion reactor program. The three areas into which the program is divided are component development, materials and radiation effects, and reactor systems and applications.

28002 **(UCID—19065) TMX upgrade experimental operating plan.** Coensgen, F.H.; Davis, J.C.; Simonen, T.C. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 1 Jul 1981. Contract W-7405-ENG-48. 30p. NTIS, PC A03/MF A01. Order Number DE81025618.

This document describes the operating plan for the TMX Upgrade experiment. This plan covers the period from November 1981 to March 1983 and describes how the TMX will be brought into operation, our schedules and milestones, and how we will determine if the TMX Upgrade program milestones have been met.

28003 **(UCRL—84874) Fluid and structural dynamic design considerations of the HYLIFE nozzle plate.** Pitts, J.H.; Ojalvo, I.U. (Lawrence Livermore National Lab., CA (USA)). Feb 1981. Contract W-7405-ENG-48. 15p. (CONF-810801—38). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

The basic concept of the High Yield Lithium Injection Fusion Energy (HYLIFE) reaction chamber involves a falling liquid-metal (lithium) jet array that absorbs 90% of the energy released from inertial confinement fusion reactions. The key element of the chamber that produces the jet array is the nozzle plate. This paper describes the design and analysis of a nozzle plate which can withstand the structural loads and permit the fluid jet array to be reestablished for a 1-Hz fusion reaction frequency. The shape of the nozzle plate and jet array is dictated by considerations of fluid dynamics and neutron-shielding. A vertical jet array, rather than a single annulus, is used because this design enhances fluid momentum interchange and dissipation of the kinetic energy that occurs when the jets disassemble. Less net outward-directed momentum results than with a single liquid annular flow configuration, thus producing lower stresses in the structural components.

28004 **(UCRL—84881(Rev.1)) Conceptual design strategy for liquid-metal-wall inertial-fusion reactors.** Monsler, M.J.; Meier, W.R. (Lawrence Livermore National Lab., CA (USA)). Feb 1981. Contract W-7405-ENG-48. 13p. (CONF-810801—39(Rev.1)). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

The liquid-metal-wall chamber has emerged as an attractive reactor concept for inertial fusion energy conversion. The principal feature of this concept is a thick, free-flowing blanket of liquid metal used to protect the structure of the reactor. The development and design of liquid-metal-wall chambers over the past decade provides a basis for formulating a conceptual design strategy for such chambers. Both the attractive and unattractive features of a LMW chamber are enumerated, and a design strategy is formulated which accommodates the engineering constraints while minimizing the liquid-metal flow rate.

28005 **(UCRL—84904) Structural and thermal requirements for the tandem-mirror fusion-test-facility magnet system.** VanSant, J.H.; Bulmer, R.H. (Lawrence Livermore National Lab., CA (USA)). 6 Feb 1981. Contract W-7405-ENG-48. 11p. (CONF-810801—6). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

Structural requirements for the magnet system include unique spatial constraints and materials restrictions to meet the operational needs of the unusual configuration. All of the magnets are liquid helium cooled which represents about 1500 tonnes of 4.5 K structure in the vacuum environment of the large vessel. Magnet support structures must satisfy complex load conditions, including electromagnetic (both normal-operating and fault conditions) and seismically induced. Improved plasma confinement, characterized by long particle lifetimes, requires attention to coil alignment and field errors. Continued monitoring of field accuracy and possible adjustment during operation are contemplated. Operating conditions for the magnet system include rapid cooldown and warm-up to minimize down time for maintenance.

28006 **(UCRL—84938) Economic potential of magnetic fusion energy.** Henning, C.D. (Lawrence Livermore National Lab., CA (USA)). 10 Mar 1981. Contract W-7405-ENG-48. 9p. (CONF-810808—1). NTIS, PC A02/MF A01.

From Energy in the man-built environment: the next decade specialty conference; Vail, CO, USA (3 Aug 1981).

Scientific feasibility of magnetic fusion is no longer seriously in doubt. Rapid advances have been made in both tokamak and mirror research, leading to a demonstration in the TFTR tokamak at Princeton in 1982 and the tandem mirror MFTF-B at Livermore in 1985. Accordingly, the basis is established for an aggressive engineering thrust to develop a reactor within this century. However, care must be taken to guide the fusion program towards an economically and environmentally viable goal. While the fusion fuels are essentially free, capital costs of reactors appear to be at least as large as current power plants. Accordingly, the price of electricity will not decline, and capital availability for reactor constructions will be important. Details of reactor cost projections are discussed and mechanisms suggested for fusion power implementation. Also

discussed are some environmental and safety aspects of magnetic fusion.

28007 **(UCRL—85479) Structural design considerations in the Mirror Fusion Test Facility (MFTF-B) vacuum vessel.** Vepa, K.; Sterbentz, W.H. (Lawrence Livermore National Lab., CA (USA)). 10 Feb 1981. Contract W-7405-ENG-48. 16p. (CONF-810801—47). NTIS, PC A02/MF A01.

From 6. international conference on structural mechanics in reactor technology; Paris, France (17 Aug 1981).

In view of favorable results from the Tandem Mirror Experiment (TMX) also at LLNL, the MFTF project is now being rescoped into a large tandem mirror configuration (MFTF-B), which is the mainline approach to a mirror fusion reactor. This paper concerns itself with the structural aspects of the design of the vessel. The vessel and its intended functions are described. The major structural design issues, especially those influenced by the analysis, are described. The objectives of the finite element analysis and their realization are discussed at length.

28008 **(UCRL—85689) Final transport of heavy-ion beams for inertial-confinement fusion.** Barletta, W.A.; Fawley, W.M.; Lee, E.P.; Yu, S.S. (Lawrence Livermore National Lab., CA (USA)). 24 Jun 1981. Contract W-7405-ENG-48. 9p. (CONF-810620—6). NTIS, PC A02/MF A01. Order Number DE81024373.

From 4. international topical conference on high-power electron and ion-beam research and technology; Palaiseau, France (29 Jun 1981).

A heavy ion beam propagating through a hard or near vacuum ($< 10^{-3}$ torr) is subject to emittance growth due to the phase space distortions caused by anharmonic self-forces. If the distortion remains uncorrected, an enlarged focal spot results. Analytic predictions of an increase in rms emittance and focal spot size are given for the hard vacuum case and are shown to agree with computer simuations for initially cold beams. Some effects of the beam preconditioning in the region from accelerator output to final focusing magnet are discussed. For the case of near vacuum transport (10^{-4} to 10^{-3} torr), prediction of final focal spot size requires consideration of additional effects such as beam stripping to high charge state and charge neutralization by electrons which are produced internally in the vessel and/or are injected from outside.

28009 **(UCRL—86019) Streak-camera recording of simultaneous optical and x-ray signals.** Lerche, R.A.; Medecki, H.; Phillips, G.E.; Thomas, S.W. (Lawrence Livermore National Lab., CA (USA)). 20 Apr 1981. Contract W-7405-ENG-48. 19p. (CONF-810527—5). NTIS, PC A02/MF A01. Order Number DE81024452.

From International conference on plasma science; Sante Fe, NM, USA (18 May 1981).

An S-1 optical streak camera with 10-ps (optical) temporal resolution simultaneously records reflected 1.06-μm laser light and suprathermal (> 30 keV) x rays from laser fusion targets. To make these measurements, the camera x-ray sensitivity is increased 30-fold without significant loss of temporal resolution by increasing the effective slit width from the normal 50 μm to 1500 μm. The measurement system is described and sample data are presented.

28010 **(UWFDM—412) Parametric cost analysis for tandem-mirror reactors similar to WITAMIR-I.** Montalvo, E.; Santarius, J.F.; Sviatoslavsky, I.N. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). Mar 1981. Contract AS02-78ET52048. 30p. (DOE/ET/52048—16). NTIS, PC A03/MF A01. Order Number DE81025627.

The recently completed tandem mirror reactor study, WITAMIR-I, contains a detailed cost analysis at a reference point. Motivated by the existence of that analysis a model is developed to obtain the dependence of cost on the most important variables. Reactor parameters are varied using POWBAL, an equilibrium power balance code. Then, POWBAL output plus cost parameters are fed into the subroutine COST. The analysis is limited to configurations similar to WITAMIR-I, expanding costs about the reference point. This is a simplified model that allows for parametric studies without necessitating the detailed evaluation done for the reference design. It is useful in setting design parameters that minimize the cost of electricity as well as in analyzing the relative importance of the different parts of the plant.

28011 **One-dimensional ion-beam neutralization by cold electrons.** Humphries, S. Jr.; Lockner, T.R.; Poukey, J.W.; Quintenz, J.P. (Sandia National Laboratories, Albuquerque, New Mexico 87185). *Physical Review Letters ;* **46**: No. 15, 995-998(13 Apr 1981).

The problem of the neutralization of one-dimensional ion beams moving through a source of cold electrons into free space has been studied using a computer simulation of the electron dynamics. The results indicate that neutralized high-intensity beams of ions appropriate for inertial fusion may be able to propagate to a focus through vacuum with negligible limits imposed by the electron pressure.

28012 **High-energy short-pulse carbon dioxide lasers.** Fenstermacher, C. (Los Alamos Scientific Lab., NM (USA)). *Philosophical Transactions of the Royal Society of London, Series A: Mathematical and Physical Sciences ;* **298**: No. 1439, 377-391(11 Nov 1980).

Lasers for fusion application represent a special class of short-pulse generators: not only must they generate extremely short temporal pulses of high quality, but they must do this at ultra-high powers and satisfy other stringent requirements. This paper presents the status of the research and development of carbon dioxide laser systems at the Los Alamos Scientific Laboratory, vis-a-vis fusion requirements.

28013 **Thermal stress waves with application to laser fusion reactions.** Hejazi, M.S. (Northwestern Univ., Evanston, IL (USA)); Lovell, E.G. (Wisconsin Univ., Madison (USA)). *Nuclear Engineering and Design ;* **60**: No. 2, 281-285(Sep 1980).

A closed-form solution is developed for stress waves in a solid resulting from volumetric energy deposition. The material is linear elastic and the geometry a plate or slab-like component. One dimensional waves perpendicular to the surface are considered. Such a model can be used to describe the response for plates or thin shells. The problem is relevant to the design of liners and first wall structure of laser fusion reactors. For demonstration purposes, examples are presented based upon the University of Wisconsin SOLASE conceptual power plant. It is shown that X-rays and reflected long wavelength laser light produce relatively small amplitude waves, but short wavelength reflected laser light can produce stresses of significant amplitude.

99 GENERAL AND MISCELLANEOUS

9901 Management

28014 **(DOE/MA—0008) Department of Energy audit report tracking system (DARTS). Quarterly management report as of March 31, 1981.** (Department of Energy, Washington, DC (USA). Office of the Controller). May 1981. 104p. NTIS, PC A06/MF A01. Order Number DE81024378.

This report provides information to DOE management on the status of corrective actions on audit recommendations contained in reports on audits of DOE activities, programs, and contracts. It is based on data accumulated in accordance with DOE Order 2300.1 which established a DOE Audit Report Tracking System (DARTS). The Order provides for bringing to the attention of the DOE Audit Review Council (DARC) such matters as corrective actions inordinately delayed, unresolved disagreements between the auditor and auditee, and controversial matters for action deemed appropriate.

9902 Mathematics And Computers

REFER ALSO TO CITATION(S) 27679, 27949, 27951

28015 (DOE/EV/10428—10) Approach to superefficient estimation. Technical report No. 45. Willits, N.H. (SIAM Inst. for Mathematics and Society, Philadelphia, PA (USA); Stanford Univ., CA (USA). Dept. of Statistics). Feb 1981. Contract AC02-80EV10428. 73p. NTIS, PC A04/MF A01.

In many estimation problems, the appropriateness of a certain estimate heavily depends on the truth or falsehood of assumptions made about the underlying state of nature. In particular, the estimate θ_1 may be a well-chosen estimate of θ when an assumption is valid, and yet the estimate θ_2 will be preferable to θ, as an estimate of θ when the assumption is invalid. An estimation scheme is developed that estimates θ by a convex combination of the two candidate estimates and the properties of the resultant estimate with respect to convergence in expected squared norm (mean squared error), convergence in distribution, and convergence in probability are discussed. A somewhat simplified statement of those results is that the convex combination possesses the asymptotic properties of θ_1 whenever the assumption is valid, and it possesses the asymptotic properties of θ_2 otherwise. This estimation scheme is applied in the context of density estimation, where the assumption under scrutiny is that the underlying density is a member of a prespecified parametric family.

28016 (LA-UR—81-1575) Effect of geometric shape on two-dimensional finite elements. Cook, W.A. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 36p. (CONF-810818—1). NTIS, PC A03/MF A01.

From 6. international seminar on computational aspects of the finite element method; Paris, France (24 Aug 1981).

Three quadrilateral elements are defined. These are an eight-nodal-point serendipity element (QUAD8s), a nine-nodal-point serendipity element (QUAD9s), and a nine-nodal-point quadrilateral element composed of two six-nodal-point triangular elements (QUAD9t). The effect that the geometric shape of the element has on the approximation function of each element is discussed. Two beam problems demonstrate that when the shape of the elements becomes skewed, the QUAD9t element significantly improves the calculated results. Finally, a recommendation is made for the QUAD8s and QUAD9t to be used together for the most efficient and accurate results.

28017 (LA-UR—81-1959) High-speed, front-end processing in data-acquisition systems. Machen, D.R. (Los Alamos National Lab., NM (USA)). 1981. Contract W-7405-ENG-36. 7p. (CONF-810623—5). NTIS, PC A02/MF A01. Order Number DE81025361.

From 24. midwest symposium on circuits and systems; Albuquerque, NM, USA (29 Jun 1981).

This paper discusses recent work in the design and application of bit-sliced microprocessor elements to front-end processing in data acquisition and control systems. A microprogrammed computing structure, based upon commercially available Schottky TTL microprocessor slices, performs high-speed subroutines at a basic operation time of 142 ns/microcycle. The structure operates in parallel with, and under the control of, a conventional microcomputer system, which is generally interfaced to a more complete system-minicomputer that actually performs the data acquisition or control task.

28018 (LBL—12578) Providing user support in a changing environment. Franz, J. (Lawrence Berkeley Lab., CA (USA)). Apr 1981. Contract W-7405-ENG-48. 14p. (CONF-810688—1). NTIS, PC A02/MF A01. Order Number DE81024991.

From American Computing Machinery special interest group on computer personnel research conference; Washington, DC, USA (4 Jun 1981).

In the face of rapidly changing products and user needs, a familiar problem to large computing facilities today is deciding what services to offer, and how to offer them. Dropping hardware costs, increasing need for interactive computing (including text processing, graphics, and data management systems), and fiscal limitations for both the central facility and the users are some of the changes being experienced at Lawrence Berkeley Laboratory. How the central computing facility can provide the services users need in the most expedient and inexpensive way possible is discussed.

28019 (SAND—81-0687) Prototype network functional requirements. Halbgewachs, R.D.; Haynes, R.A.; Jensen, J.E.; Payne, W.H. (Sandia National Labs., Albuquerque, NM (USA)). Jun 1981. Contract AC04-76DP00789. 16p. NTIS, PC A02/MF A01. Order Number DE81026660.

The goal of the prototype network is to provide a software development tool for various network nodes of the Sandia Scientific Computer Network before they are connected to the production network. This report describes how an applications program executing on one CDC 7000 computer will perform a bidirectional exchange of information with an applications program on another CDC 7000 computer. Validation of the information exchange, the necesary connection and termination calls, and development support functions are explained.

28020 (SAND—81-1543c) Adaptive IIR algorithms based on gradient search. David, R.A.; Stearns, S.D. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 6p. (CONF-810623—7). NTIS, PC A02/MF A01. Order Number DE81023927.

From 24. midwest symposium on circuits and systems; Albuquerque, NM, USA (29 Jun 1981).

The two-pole IIR adaptive algorithm, which is easily constrained to maintain stability during the adaptive process is studied. Characteristics of the mean squared error surface are discussed, and an example is presented which illustrates the performance of a recursive LMS algorithm. A new algorithm is introduced in which coefficients are adjusted according to a smoothed directional estimate of the performance surface gradient.

28021 (SLAC-PUB—2728) CAMAPPLE: CAMAC interface to the Apple computer. Oxoby, G.J.; Trang, Q.H.; Williams, S.H. (Stanford Linear Accelerator Center, CA (USA)). Apr 1981. Contract AC03-76SF00515. 9p. (CONF-810539—5). NTIS, PC A02/MF A01. Order Number DE81025146.

From Conference on the application of microprocessors to high energy physics experiments; Geneva, Switzerland (4 May 1981).

The advent of the personal microcomputer provides a new tool for the debugging, calibration and monitoring of small scale physics apparatus, e.g., a single detector being developed for a larger physics apparatus. With an appropriate interface these microcomputer systems provide a low cost (1/3 the cost of a comparable minicomputer system), convenient, dedicated, portable system which can be used in a fashion similar to that of portable oscilloscopes. Here, an interface between the Apple computer and CAMAC which is now being used to study the detector for a Cerenkov ring-imaging device is described. The Apple is particularly well-suited to this application because of its ease of use, hi-resolution graphics, peripheral bus and documentation support.

28022 (SLAC-PUB—2735) FORTH-79 limitations on code threading techniques. Holmes, T. (Stanford Linear Accelerator Center, CA (USA)). 1981. Contract AC03-76SF00515. 4p. (CONF-810599—1). NTIS, PC A02/MF A01. Order Number DE81025090.

From 4. standards conference; Rochester, NY, USA (12 May 1981).

The matter of code threading is not treated by the 1979 FORTH Standard and hence is left as an implementation design decision. This paper examines the Standard for ambiguities in terminology and possible limitations which face the system designer. The first issue considered is whether existing systems can conform to the guidelines given in the standard. A second issue is the implementation of other varieties of threaded code to extend the capabilities of FORTH.

28023 Dimension and character formulas for Lie supergroups. Balantekin, A.B.; Bars, I. (Physics Department, Yale University, New Haven, Connecticut 06511). Contract EY-76-C-02-3075DE-AC02-76ER03074. *Journal of Mathematical Physics (New York)* ; **22**: No. 6, 1149-1162(Jun 1981).

A character formula is derived for Lie supergroups. The basic technique is that of symmetrization and antisymmetrization associated with Young tableaux generalized to supergroups. We rewrite the characters of the ordinary Lie groups U(N), O(N), and Sp(2N) in terms of traces in the fundamental representation. It is then shown that by simply replacing traces with supertraces the characters of certain representations for U(N/M) and OSP(N/2M) are obtained. Dimension formulas are derived by calculating the characters of a special diagonal supergroup element with (+1) and (-1) eigenvalues. Formulas for the eigenvalues of the quadratic Casimir operators are given. As applications, the decomposition of a representation into representations of subgroups is discussed. Examples are given for the Lie supergroup SU(6/4) which has physical applications as a dynamical supersymmetry in nuclei.

28024 **Application of a digital computer to data acquisition and shield temperature control of a high-temperature, adiabatic calorimeter.** Cash, W.M.; Stansbury, E.E.; Moore, C.F.; Brooks, C.R. (Chemical, Metallurgical and Polymer Engineering Department, The University of Tennessee, Knoxville, Tennessee 37917). *Review of Scientific Instruments ;* **52**: No. 6, 895-901(Jun 1981).

The use of a digital computer, operating under real-time, time-sharing mode, for the operation of a high-temperature (300—1300 K), adiabatic calorimeter is described. The specimen temperature and power to the specimen heater are logged continuously, from which the heat capacity is calculated for specified temperature intervals (e.g., 20 K). The determinate error in the calculated heat capacity is about +- 0.6%. The temperature control of the adiabatic shields is quite comparable with that obtained previously with analog controllers. The temperature difference between the specimen and a shield can be maintained to about +- 0.1 K. The heat capacity of a pure titanium specimen has been measured from 320 to 1020 K using the computer and also using the analog control. No discernible difference in results can be seen. The heat capacity data scatter about +- 1% from a smooth curve fitted through the 325 data points.

28025 **Moving finite element method: Applications to general partial differential equations with multiple large gradients.** Gelinas, R.J.; Doss, S.K.; Miller, K. (Science Applications, Inc., Pleasanton, California 94566). Contract ER-78-C-03-2078. *Journal of Computational Physics ;* **39**: No. 3, 202-249(1 Mar 1981).

The moving finite element (MFE) method has been reduced to practice in the automatic solution program DYLA for general systems of transient partial differential equations (PDEs) in 1-D. Several test examples are presented which illustrate the unique node movement and systematic control features which are intrinsic in the MFE method. Computational dilemmas of numerical diffusion, Gibbs overshooting and undershooting, zone tangling, and grid remap (or re-connection) aliasing, which occur frequently in conventional PDE methods, are essentially eliminated in the MFE mehtod. Arbitrarily large gradients (or shocks) can be solved with extremely high resolution and accuracy for non-coincident, or even counterdirected, propagating wavefronts. Boundary layers of arbitrarily small dimensions are solved with high accuracy simultaneously with the large-scale structures in reactive and non-reactive fluid calculations. The MFE method requires a small fraction of the grid nodes which are used in conventional PDE solution methods because the nodes migrate continuously and systematically to those positions where they are most needed in order to yield accurate PDE solutions on entire problem domains. Courant—Friedrichs—Lewy time-step limits are exceeded by wide margins (by factors of two to several thousand). Finally, the extension of the MFE method to 2-D is briefly discussed.

9903 Information Handling

REFER ALSO TO CITATION(S) 28018

28026 **(DP—929-1-Suppl.4) Publications, 1977 through 1980.** Hilborn, H.S. (comp.). (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Apr 1981. Contract AC09-76SR00001. 204p. NTIS, PC A10/MF A01. Order Number DE81023965.

Portions of document are illegible.

This is a compilation of documents that communicate the results of scientific and technical work done at Savannah River. The compilation includes those documents that have been published (research and development reports, journal articles, book chapters, etc.), and documents that have been announced in Energy Research Abstracts. Where applicable the meeting at which the paper was presented is given. The information was compiled by machine methods to produce bibliographic, subject, and author listings. This report updates the information included in DP-929, Rev. 2, Publications, 1951 through 1971 and DP-929-1, Publications, 1972 through 1976, and replaces DP-929-1, Supplement 3.

9905 Civilian Defense

28027 **(CONF-810671—1) Incorporating civil-defense shelter space in new underground construction.** Chester, C.V. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 27p. NTIS, PC A03/MF A01. Order Number DE81023212.

From Underground space conference and exposition; Kansas City, KS, USA (8 Jun 1981).

At the present time, the population of the US is approximately ten times more vulnerable to nuclear weapons than the Soviet population. This vulnerability can be reduced rapidly by urban evacuation in a crisis. However, the need to keep the essential economy running in a crisis, as well as coping with attacks on short warning, makes the construction of shelter space where people live very desirable. This can be done most economically by slightly modifying underground construction intended for peacetime use. The designer must consider all elements of the emergency environment when designing the space. Provisions must be made for emergency egress, light and ventilation (without elecric power), blast closures, water, sanitation, and food. The option of upgrading the space in a crisis should be considered. An example is given.

CORPORATE INDEX

In the Corporate Index, report literature is indexed using the name of the organization or institution responsible for issuing the report. Headings are provided for all report literature and for published literature for which a corporate approach is especially desirable, e.g., symposium and conference proceedings.

Each entry under a corporate heading gives the report title and the volume and abstract numbers. Report numbers, if applicable, are given in parentheses at the end of the entry.

DOE Energy Information Data Base: Corporate Author Entries (DOE/TIC-4585) is used in the standardization of corporate entries. DOE/TIC-4585 is available for purchase from the National Technical Information Service (NTIS), U. S. Department of Commerce, Springfield, Virginia 22161.

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Acres American, Inc., Columbia, MD
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 4. System planning studies. Final report, 6:27187 (EPRI-EM—1589(Vol.4))

Aerospace Corp., El Segundo, CA (USA)
Technical analysis support for transportation energy conservation division of DOE. Fifth progress report for December 1978, 6:27321 (DOE/CS/52184—T4)

Aerospace Corp., El Segundo, CA (USA). Eastern Technical Div.
Technical analysis support for Transportation Conservation Division of DOE. Ninth progress report, April 1979, 6:27322 (DOE/CS/52184—T5)
Technical analysis support for Transportation Energy Conservation Division of DOE. Seventh progress report for February 1979, 6:27323 (DOE/CS/52184—T6)
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Technical analysis support for Transportation Energy Conservation Division of DOE. Eighth progress report for March 1979, 6:27326 (DOE/CS/52184—T9)
Technical analysis support for Transportation Energy Conservation Division of DOE. Eleventh progress report for June 1979, 6:27324 (DOE/CS/52184—T7)

Aerospace Corp., El Segundo, CA (USA). Energy and Resources Div.
Assessments and requirements for the integration of new technologies into electric utility systems. Summary of the Aerospace Corporation activities, January-November 1980, 6:27249 (DOE/ET/30351—T2)

Aerospace Corp., Los Angeles, CA (USA). Energy and Resources Div.
Assessments and requirements for the integration of new technologies into electric utility systems. Summary of the Aerospace Corporation activities, January-November 1980, 6:27249 (DOE/ET/30351—T2)

Altas Corp., Santa Cruz, CA (USA)
Final draft: IEA Task 1. Report on Subtask D, optimization of solar heating and cooling systems, 6:27043 (DOE/CS/30579—T1)

Aluminum Co. of America, Alcoa Center, PA. Alcoa Labs.
Pulverized coal firing of aluminum-melting furnaces. Second annual technical progress report, July 1979-June 1980, 6:27332 (DOE/CS/40037—T3)
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Arnold Engineering Development Center, Arnold Air Force Station, TN (USA)
MHD high-performance demonstration experiment interagency agreement No. ET-78-I-01-2895. Quarterly progress report, October 1-December 31, 1980, 6:27279 (DOE/ET/11417—T1)

Atomic Power Development Associates, Inc., Detroit, MI (USA)
Fermi-1: microfilm record of the design, construction, and operation [index only], 6:27150 (NP—25267)

Avco-Everett Research Lab., Inc., Everett, MA (USA)
Volatile production during preignition coal heating. Quarterly progress report, January 1981-March 1981, 6:26780 (DOE/PC/30291—T1)

Avco Systems Div., Wilmington, MA (USA)
Toward optimization of the woven flywheel, 6:27188 (UCRL—15359)

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Babcock and Wilcox Co., Barberton, OH (USA). Fossil Power Generation Div.
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BDM Corp., Albuquerque, NM (USA)
Conceptual design and analysis of a 100-MWe distributed line-focus solar central power plnt. Volume II. Technical report. Final report, September 29, 1978-September 30, 1979, 6:27015 (DOE/ET/20524—T1)
Conceptual design and analysis of a 100-MWe distributed line focus solar power plant. Final report, 6:27027 (DOE/ET/20524—1(Vol.1))
Conceptual design and analysis of 100-MWe distributed line focus solar power plant. Final report, 6:27028 (DOE/ET/20524—1(Vol.2))

Bechtel Corp., San Francisco, CA (USA)
Geothermal commercial power plant study. Monthly progress report, January 29, 1977-February 25, 1977, 6:27087 (DOE/ET/28311—T1)

Bechtel Power Corp., San Francisco, CA (USA)
Coal-fired power-plant-capital-cost estimates. Final report, 6:27107 (EPRI-PE—1865)

Bendix Corp., Kansas City, MO (USA)
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Bendix Field Engineering Corp., Grand Junction, CO (USA)
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Brown Univ., Providence, RI (USA). Div. of Engineering
Combined macroscopic and microscopic approach to the fracture of metals. Annual progress report, 1980-1981, 6:27357 (DOE/ER/10556—85)

Bureau of Land Management, Denver, CO (USA)
Rocky Mountain pipeline project: draft environmental impact statement, 6:26851 (FERC/EIS—0024D)

C

California Energy Resources Conservation and Development Commission, Sacramento (USA). Assessment Div.
Annual energy production and consumption, 1979, 6:27239 (P—300-80-031)

California State Univ., Chico (USA). Dept. of Economics
Macroeconomic implications of energy policy. Final report, 6:27696 (P—110-80-004)

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Water constraints on energy development: a framework for analysis, 6:27695 (LBL—9626)

California Univ., Livermore (USA). Lawrence Livermore Lab.
Determination of glutamic acid, aspartic acid, and aminoacetic acid by potentiometric titration using a Cu^{2+}-sensitive electrode, 6:27453 (UCRL-Trans—11668)
Development of a potassium hydrogen phosphate adhesive for use in KDP laser arrays, 6:27459 (UCID—18925)
Polymer-filler studies, 6:27418 (UCRL—15362)
TMX upgrade experimental operating plan, 6:28002 (UCID—19065)

California Univ., Los Angeles (USA)
Financing options for a local conservation and solar retrofit program, 6:27227 (LA-UR—81-1202)

California Univ., San Diego, La Jolla (USA)
Study of $Eu_{1.2}Mo_6S_8$ under high pressure and high magnetic field, 6:27946 (LA-UR—81-1013)

Carrier Corp., Syracuse, NY (USA). Energy Systems Div.
Development of a high temperature solar powered water chiller. Phase III technical progress report, April 1, 1979-September 30, 1979, 6:27044 (DOE/CS/31590—)

Catalysis Research Corp., Palisades Park, NJ (USA)
Two-stage coal liquefaction process. Quarterly report, July 1-September 30, 1979, 6:26758 (FE—3046-T5)

Catalytic, Inc., Wilsonville, AL (USA)
Evaluation of liquid-phase prilling as a technique for SRC solidification, 6:26740 (DOE/ET/10154—T9)

Charles River Associates, Inc., Boston, MA (USA)
Consumer choice and market penetration of new technologies: application of a discrete-choice model. Final report. CRA report No. 423, 6:27223 (ORNL/Sub—80/45734/1)

Chevron Research Co., Richmond, CA (USA)
Some geochemical characteristics of the Pachuca Obsidian Region: a strategy for interpreting artifact groups, 6:27827 (BNL—29656)

Chicago State Univ., IL (USA). Dept. of Biological Sciences
Establishment of bryophytes on a reclaimed surface mine site at Goose Lake Prairie State Park, Illinois, 6:26798 (CONF-800114—1)

Colorado School of Mines, Golden (USA)
New process for producing carbon monoxide and hydrogen. Final technical report on Grant EF77G-012732, 6:26742 (DOE/ET/10584—T1)

Colorado State Univ., Fort Collins (USA). Solar Energy Applications Lab.
Performance of evacuated tubular solar collectors in a residential heating and cooling system. Final report, 1 October 1978-30 September 1979, 6:27039 (COO—2577-20)

Conoco Coal Development Co., Library, PA (USA). Research Div.
Recycle slurry-oil characterization. Quarterly report No. 2, January 1-March 31, 1981, 6:26747 (DOE/PC/30027—9)

Conoco, Inc., Stamford, CT (USA)
Phase I: the pipeline-gas demonstration plant. Demonstration plant engineering and design. Volume 1. Executive summary, 6:26772 (DOE/ET/13060—T3(Vol.1))
Phase I: the pipeline-gas demonstration plant. Demonstration plant engineering and design. Volume 18. Plant Section 2700 - Waste Water Treatment, 6:26774 (DOE/ET/13060—T3(Vol.18))
Phase I: the pipeline-gas demonstration plant. Demonstration plant engineering and design. Volume 17. Plant section 2500 - Plant and Instrument Air, 6:26773 (DOE/ET/13060—T3(Vol.17))
Phase I: the pipeline-gas demonstration plant. Demonstration plant engineering and design. Volume 22. Plant Section 4000 - Electrical and Communications, 6:26776 (DOE/ET/13060—T3(Vol.22))
Pipeline gas demonstration plant, Phase I. Demonstration plant engineering and design. Volume 20. Plant section 3200, miscellaneous offsites and tank farm, 6:26775 (DOE/ET/13060—T3(Vol.20))

Cornell Univ., Ithaca, NY (USA). Dept. of Materials Science and Engineering
Hydrogen and deuterium trapping in iron, 6:27356 (DOE/ER/03166—T2)

Cornell Univ., Ithaca, NY (USA). Lab. of Nuclear Studies
Large-angle two-photon exclusive channels in quantum chromodynamics, 6:27892 (SLAC-PUB—2733)

Cornell Univ., Ithaca, NY (USA). Lab. of Plasma Studies
Particle ring fusion, 6:27958 (CONF-810364—2)

Courtesy Associates, Inc., Washington, DC (USA)
DOE thermal and chemical storage annual contractor's review meeting, 6:27189 (CONF-801055—)

Curtiss-Wright Corp., Wood-Ridge, NJ (USA). Power Systems Div.
High temperature turbine technology program. Phase II. Technology test and support studies. Technical progress report, March 1-March 31, 1981, 6:27104 (CW-WR—76-02086)

D

Dayton Univ., OH (USA). Research Inst.
Fourth annual progress report on the electrofluid dynamic wind generator. Final report, 1 April 1979-31 August 1980, 6:27092 (DOE/ET/20258—T1)

Delaware Univ., Newark (USA). Dept. of Chemical Engineering
Heat storage in alloy transformations. Final report, 6:27208 (DOE/NASA/3184—2)

Delta Marine Consultants, Gouda (Netherlands)
OTEC LSCT study, additional work. Final report, 6:27031 (DOE/NOAA/OTEC—37)

Denver Univ., CO (USA). Center for Environmental Sciences
Oil shale research and coordination. Progress report, 1980-1981, 6:26868 (DOE/EV/10298—T1)

Department of Energy, Aiken, SC (USA). Savannah River Operations Office
Savannah River Waste Management Program plan - FY1981, 6:26899 (DOE/SR-WM—81-1)

Department of Energy, Grand Junction, CO (USA). Grand Junction Office
Uranium exploration expenditures in 1980 and plans for 1981-1982, 6:26891 (GJO—103-81)

Department of Energy, Las Vegas, NV (USA). Nevada Operations Office
Bibliography of the published reports, papers, and articles on the Nevada Nuclear Waste Storage Investigations, 6:26906 (NVO—196-24)

Department of Energy, New York (USA). Environmental Measurements Lab.
Environmental Measurements Laboratory. Environmental report, September 1, 1980-March 1, 1981, 6:27646 (EML—390)

Department of Energy, Washington, DC (USA)
Bonneville Power Administration final environmental impact statement: alumax environmental impact statement, 6:27698 (DOE/EIS—0076)

Residential-conservation service program final rule, 6:27307 (DOE/TIC—1018826)
Water availability and use for energy production, 6:27693 (HEDL-SA—2370-FP)

Department of Energy, Washington, DC (USA). Assistant Secretary for Fossil Energy
Low/medium btu coal gasification assessment program for specific sites of two New York utilities. Executive summary, 6:26745 (DOE/FE/20223—1)

Department of Energy, Washington, DC (USA). Assistant Secretary for Nuclear Energy
Long-term management of liquid high-level radioactive wastes stored at the Western New York Nuclear Service Center, West Valley, 6:26898 (DOE/EIS—0081D)

Department of Energy, Washington, DC (USA). Office of Consumption Data System
Residential energy-consumption survey: consumption and expenditures, April 1978-March 1979, 6:27306 (DOE/EIA/0207—5)

Department of Energy, Washington, DC (USA). Office of Industrial Programs
Agriculture and Food Processes Branch program summary document, 6:27330 (DOE/CE—0013)

Department of Energy, Washington, DC (USA). Office of the Controller
Department of Energy audit report tracking system (DARTS). Quarterly management report as of March 31, 1981, 6:28014 (DOE/MA—0008)

Department of Housing and Urban Development, Washington, DC (USA)
Solar project description for Hyde Brothers Building Company, Inc. single-family dwelling, Clarksdale, Mississippi, 6:27057 (SOLAR/1048—81/50)
Solar project description for John Byram, Jr. single-family residence; Shawnee Mission, Kansas, 6:27056 (SOLAR/1004—81/50)
Solar project description for Loyola University-Biever Hall men's dormitory, New Orleans, Louisiana, 6:27058 (SOLAR/1055—81/50)
Solar project description for Ortiz and Reill Developers, Inc., (Lot 8) single family residence, Escondido, California, 6:27059 (SOLAR/1087—81-50)

Ducat Investments, Inc., Kansas City, KS (USA)
Solar space heating installed at Kansas City, Kansas. Final report, 6:27046 (DOE/NASA/CR—161763)

Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.
Description of DWPF reference waste form and canister, 6:26900 (DP—1606)
Publications, 1977 through 1980, 6:28026 (DP—929-1-Suppl.4)

Dynalysis of Princeton, NJ (USA)
Gulf of Mexico numerical model. Project summary, 6:27030 (DOE/ET/20612—3)

E

EG and G Idaho, Inc., Idaho Falls (USA)
Calculated GCFR fuel rod behavior for steady state and transient operation, 6:27144 (CONF-810803—6)
FRAP-T5 uncertainty study of five selected accidents and transients, 6:27165 (CONF-810803—5)
Fusion Reactor Safety Research program. Annual report, FY-80, 6:27992 (EGG—2106)
Heating calculations of fusion blanket experiments in a fission reactor, 6:27991 (DOE/ID/01570—T22)
Influence of FRAPCON-1 evaluation models on fuel behavior calculations for commercial power reactors, 6:27132 (CONF-810803—4)
Physics calculations for the RIA 1-3 irradiated rod test, 6:27171 (EGG-PHYS—5298)
Quick look report, entry 4: Three Mile Island Unit 2, November 13, 1980, 6:27172 (GEND—004)

EG and G, Inc., Goleta, CA (USA)
Radiation-to-light converters for nuclear environments: deep red emitters, 6:27581 (UCRL—85608)

EG and G, Inc., Las Vegas, NV (USA). Energy Measurements Group
Surface and subsurface gamma survey of the Kellex Site, Jersey City, New Jersey: dates of survey, September 8-November 11, 1980, 6:27658 (EGG—1183-1795)

EG and G, Inc., Los Alamos, NM (USA)
Preparation, installation, and calibration of a 152-fiber imaging experiment at the Nevada Test Site, 6:27630 (LA-UR—81-1944)

EG and G, Inc., Santa Barbara, CA (USA)
Scintillators for fiber optics: system sensitivity and bandwidth as a function of fiber length, 6:27578 (LA-UR—81-1945)

EIC Labs., Inc., Newton, MA (USA)
Thermal storage studies for solar heating and cooling: applications using chemical heat pumps. Final report, September 15, 1979-April 15, 1980, 6:27042 (DOE/CS/30248—T1)

Electric Power Research Inst., Palo Alto, CA (USA)
Modeling and conduct of turbine missile concrete impact experiments, 6:27178 (SAND—81-0352C)
Synthetic fuels: status and directions. Volume 1. Sections 1-17. Conference proceedings, 6:27241 (EPRI-WS—79-238(Vol.1))

Electric Power Research Inst., Palo Alto, CA (USA). Coal Combustion Systems Div.
Joint symposium on stationary combustion NO/sub x/ control: proceedings, 6:27112 (EPRI-WS—79-220(Vol.1))
Joint symposium on stationary combustion NO/sub x/ control: proceedings, 6:27128 (EPRI-WS—79-220(Vol.2))

Energy, Inc., Albuquerque, NM (USA)
RELAP4 calculations of small break LOCAS in PWRs equipped with upper-head injection, 6:27177 (SAND—81-0322C)

Exxon Nuclear Idaho Co., Inc., Idaho Falls (USA)
Independent review panel to evaluate and review alternative waste forms to immobilize the Idaho Chemical Processing Plant (ICPP) calcined waste. Final report, 6:26901 (ENICO—1088)

F

Federal Energy Regulatory Commission, Washington, DC (USA). Office of Pipeline and Producer Regulation
Rocky Mountain pipeline project: draft environmental impact statement, 6:26851 (FERC/EIS—0024D)

Fermi National Accelerator Lab., Batavia, IL (USA)
Magnetic monopole bibliography, 1977-1980, 6:27891 (FERMILAB—81/37)

Filtrol Corp., Los Angeles, CA (USA)
Development of new catalysts for coal-liquids refining. First quarterly report, 1 January 1979-31 March 1979, 6:26743 (DOE/ET/12103—T1)
Development of new catalysts for coal-liquids refining. Second quarterly report, 1 April 1979-30 June 1979, 6:26744 (DOE/ET/12103—T3)

Florida Univ., Gainesville (USA)
Synthesis and characterization of novel polymers from non-petroleum sources for use in enhanced oil recovery, 6:27417 (DOE/ER/05947—T1)

Foster Wheeler Energy Corp., Livingston, NJ (USA)
Phase I: the pipeline-gas demonstration plant. Demonstration plant engineering and design. Volume 1. Executive summary, 6:26772 (DOE/ET/13060—T3(Vol.1))
Phase I: the pipeline-gas demonstration plant. Demonstration plant engineering and design. Volume 17. Plant section 2500 - Plant and Instrument Air, 6:26773 (DOE/ET/13060—T3(Vol.17))
Phase I: the pipeline-gas demonstration plant. Demonstration plant engineering and design. Volume 22. Plant Section 4000 - Electrical and Communications, 6:26776 (DOE/ET/13060—T3(Vol.22))
Phase I: the pipeline-gas demonstration plant. Demonstration plant engineering and design. Volume 18. Plant Section 2700 - Waste Water Treatment, 6:26774 (DOE/ET/13060—T3(Vol.18))
Pipeline gas demonstration plant, Phase I. Demonstration plant engineering and design. Volume 20. Plant section 3200, miscellaneous offsites and tank farm, 6:26775 (DOE/ET/13060—T3(Vol.20))

G

Garrett Corp., Los Angeles, CA (USA). Airesearch Mfg. Div.
Near-term electric vehicle program. Phase II. Power system performance review, 6:27346 (DOE/CS/51213—T7)

Gary Energy Corp., Englewood, CO (USA)
Bell Creek Field micellar-polymer pilot demonstration. Fourth annual report, October 1979-September 1980, 6:26836 (DOE/SF/01802—56)

General Accounting Office, Washington, DC (USA)
Impact of geothermal development on stockraising homestead landowners, 6:27076 (EMD—81-39)
Impact of regulations - after federal leasing - on Outer Continental Shelf oil and gas development, 6:26844 (EMD—81-48)
Issues in leasing offshore lands for oil and gas development, 6:26845 (EMD—81-59)
Low productivity in American coal mining: causes and cures, 6:26807 (EMD—81-17)
Natural gas plan needed to provide greater protection for high-priority and critical uses, 6:26858 (EMD—81-27)
Potential for diversifying oil imports by accelerating worldwide oil exploration and production, 6:27238 (ID—81-07)
Unauthorized commitments: an abuse of contracting authority in the Department of Energy, 6:27234 (EMD—81-12)

General Atomic Co., San Diego, CA (USA)
Behavior of graphite during rapid depressurization, 6:27163 (CONF-810604—5)
Density limit in tokamaks, 6:27961 (GA-A—15172)
Doppler ion program description, 6:27962 (GA-A—16140)
HTGR Fuel Technology Program. Semiannual report for the period ending March 31, 1981, 6:27140 (GA-A—16333)
Interpretation of bend strength increase of graphite by the couple-stress theory, 6:27138 (GA-A—16056)
Nondestructive examination of 51 fuel and reflector elements from Fort St. Vrain Core Segment 1, 6:27137 (GA-A—16000)
Transient stress wave propagation in HTGR fuel element impacts, 6:27139 (GA-A—16241)

General Electric Co., Cincinnati, OH (USA). Advanced Energy Programs Dept.
Investigation of demonstration site and commercialization potential of new and planned pipelines. Task I, 6:27320 (DOE/CS/51381—T3)

General Electric Co., San Jose, CA (USA). Advanced Reactor Systems Dept.
Chemical cleaning specification: few tube test model, 6:27145 (DOE/SF/70030—T21)

General Electric Co., San Jose, CA (USA). Nuclear Engineering Div.
Dilute chemical decontamination program. Quarterly report 5, October 1-December 31, 1978, 6:27133 (DOE/ET/34203—41)
Dilute chemical decontamination program. Semi-annual report (quarters 6 and 7), January 1-June 30, 1979, 6:27134 (DOE/ET/34203—42)

General Electric Co., Schenectady, NY (USA). Energy Systems Programs Dept.
Long-Term Materials-Test Program. Annual report and Qualification Test Plan, October 1979-September 1980, 6:27105 (DOE/ET/15457—160)

General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.
Thermal diffusivities of molybdenum/alumina cermets, 6:27404 (GEPP-TIS—472)

General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.
Effectiveness of various leak-protection systems as initiators of automatic shutdown, 6:27166 (DOE/SF/70030—T20)
Evaluation of LLTR Series II Test A-3 results, 6:27167 (DOE/SF/70030—T22)
Initial evaluations of shutdown heat removal for CDS using the GENCON code, 6:27146 (DOE/SF/71032—T14)
Nature, analysis, and impact of common-cause failures on the design and licensing of future LBRs, 6:27168 (DOE/SF/71032—T12)
Self-actuated shutdown-system development: system response-analysis status, 6:27169 (DOE/SF/71032—T13)
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Thermal performance, dynamic stability, and thermal-stress cycling analysis of radiation-heated boiler tubes based on a 5-tube panel test, 6:27024 (SAND—81-8180)

General Electric Co., Sunnyvale, CA (USA). Energy Systems and Technology Div.
Sparging test, 6:27170 (DOE/SF/71032—T16)

General Research Corp., Santa Barbara, CA (USA)
Energy use of electric vehicles, 6:27345 (DOE/CS/51180—T3)
Model description: Regional Emissions Projection System (REPS), 6:27636 (DOE/CS/51180—T6)
Projected characteristics of light electric trucks, 6:27344 (DOE/CS/51180—T2)
Technical operating documentation: Regional Emissions Projection System (REPS), 6:27634 (DOE/CS/51180—T4)
Users guide: Regional Emissions Projection System (REPS), 6:27635 (DOE/CS/51180—T5)

Geological Survey, Knoxville, TN (USA)
Water-level data: for wells in and near burial ground 4, Oak Ridge National Laboratory, Tennessee, 1975-1979, 6:26926 (USGS-OFR—81-339)

Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht-Tesperhude (Germany, F.R.)
Description of steam-condensation phenomena during the loss-of-coolant accident, 6:27180 (UCRL—84882(Summ.))

GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht G.m.b.H., Hamburg (Germany, F.R.)
Description of steam condensation phenomena during the loss-of-coolant accident, 6:27179 (UCRL—84882)

Grumman Aerospace Corp., Bethpage, NY (USA)
Electrochemical photovoltaic cells: II. VI compound thin-film electrodes. Quarterly technical progress report No. 3, December 1980-February 1981, 6:26994 (SERI/PR—8002-8-T2)

Gulf Science and Technology Co., Pittsburgh, PA (USA). Chemical and Minerals Div.
Solvent Refined Coal (SRC) process. Selected physical, chemical, and thermodynamic properties of narrow boiling range coal liquids for the SRC-II process. Interim report, March 1980-February 1981, 6:26738 (DOE/ET/10104—7)

H

Hanford Engineering Development Lab., Richland, WA (USA)
Destructive examination of 3-cycle LWR fuel rods from Turkey Point Unit 3 for the Climax-Spent Fuel Test, 6:27136 (HEDL-TME—80-89)
Fast Flux Test Facility, 6:27160 (HEDL-SA—2314-FP)
Fast Flux Test Facility (FFTF) maintenance provisions, 6:27147 (HEDL—6937)
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Touch-sensitive graphics terminal applied to process control, 6:26892 (HEDL-SA—2260-FP)
Validation of the STAFF-5 computer model, 6:26894 (HEDL-TC—1768)
Water availability and use for energy production, 6:27693 (HEDL-SA—2370-FP)

Hart (Fred C.) Associates, Inc., New York (USA)
Assessment of needs and management options for the disposal of coal wastes in New York state, 6:26796 (NYSERDA—80-33)
Methodology for determining the impact of environmental regulatory programs. Final report, 6:26813 (EPRI-CS—1834)

Harvard Univ., Cambridge, MA (USA)
Determination of the neutron magnetic moment, 6:27915 (CONF-810695—1)

High Life Helicopters, Inc., Puyallup, WA (USA)
Airborne gamma-ray spectrometer and magnetometer survey: Miles City quadrangle (Montana). Final report, 6:26879 (GJBX—180-81-Vol.2B)
Airborne gamma-ray spectrometer and magnetometer survey: Rockford Quadrangle, Aurora Quadrangle (IL), Madison Quadrangle (WI). Final report, 6:26881 (GJBX—181-81Vol.1)

Airborne gamma-ray spectrometer and magnetometer survey: Madison quadrangle (WI). Final report, 6:26882 (GJBX—181-81-Vol.2A)
Airborne gamma-ray spectrometer and magnetometer survey: Watford City quadrangle (North Dakota). Final report, 6:26880 (GJBX—180-81-Vol.2D)
Airborne gamma-ray spectrometer and magnetometer survey: Aurora quadrangle (IL). Final report, 6:26884 (GJBX—181-81-Vol.2C)
Airborne gamma-ray spectrometer and magnetometer survey: Rockford quadrangle (IL). Final report, 6:26883 (GJBX—181-81-Vol.2B)
Airborne gamma-ray spectrometer and magnetometer survey, 6:26890 (GJBX—211(811))

Hydrocarbon Research, Inc., Lawrenceville, NJ (USA)
H-coal process improvement study: bench unit baseline run with preheater/reactor, 6:26739 (DOE/ET/10152—T6)

I

ICF, Inc., Washington, DC (USA)
Utilities and energy efficiency: new opportunities and risks. Conference proceedings, 6:27229 (CONF-8010146—)

Idaho National Engineering Lab., Idaho Falls (USA)
PWR fuel behavior: lessons learned from LOFT, 6:27164 (CONF-810803—1)

Illinois Inst. of Tech., Chicago (USA)
Environmental effects of the satellite power system microwave power transmission system, 6:27762 (CONF-801261—1)
Experiment showing a mechanical manifestation of the helicity of transport current in superconducting wires, 6:27534 (LA-UR—81-937)

Illinois Inst. of Tech., Chicago (USA). Dept. of Chemical Engineering
Electrochemistry of carbides and carbon cathodes in molten halides. Progress report, 1980-1981, 6:27283 (DOE/ER/04445—1)

Illinois Mining and Mineral Resources Research Inst., Carbondale (USA)
Ground water monitoring system design: the Iowa Coal Project demonstration mine No. 1, a case study, 6:26800 (IS-M—326)

Illinois Univ., Urbana (USA)
Studies in chemical physics through high-pressure luminescence, 6:27860 (DOE/ER/01198—1355)

Illinois Univ., Urbana (USA). Fusion Studies Lab.
Recovery of magnetic energy in an MPR expansion chamber, 6:27988 (CONF-810812—14)

Illinois Univ., Urbana (USA). Inst. for Environmental Studies
Analysis of mineral phases in coal utilizing factor analysis, 6:26779 (DOE/EV/10403—1)

Imperial Coll. of Science and Technology, London (UK)
On-line experience with the 168/E, 6:27580 (SLAC-PUB—2726)

Institut Max von Laue - Paul Langevin, 38 - Grenoble (France)
Determination of the neutron magnetic moment, 6:27915 (CONF-810695—1)

International Business Machines Corp., San Jose, CA (USA). Research Lab.
High field phase transition in $(TMTSF)_2PF_6$ under pressure, 6:27947 (SAND—81-0838C)

International Power Technology, Inc., Sunnyvale, CA (USA)
Design and test of an exhaust-gas clean-up system for powerplants using high-sulphur-content fuels, 6:27111 (DOE/ET/12442—T1)

J

Japan Atomic Energy Research Inst., Tokai, Ibaraki. Tokai Research Establishment
Effect of non-heterogeneous wetwell boundaries on pressure suppression system response, 6:27181 (UCRL—84883(Summ.))

Jensen Associates, Inc., Washington, DC (USA)
Intrastate natural gas market analysis. Technical topical report, 1 December 1978-20 March 1979, 6:26850 (DOE/TIC—1025490)

Jet Propulsion Lab., Pasadena, CA (USA)
Proceedings of the 17th project integration meeting. Progress report 17, September 1980-February 1981, 6:26990 (DOE/JPL—1012-54)
Solar thermal power systems: parabolic dish project. Annual technical report, Fiscal Year 1980, 6:27019 (DOE/JPL—1060-45)

Johns Hopkins Univ., Laurel, MD (USA). Applied Physics Lab.
Flywheels: mobile applications, 6:27347 (UCRL—15363)

Johnson Controls, Inc., Milwaukee, WI (USA)
Commercialization of a thick-film solar cell. Final technical report, September 15, 1980-April 30, 1981, 6:27001 (SERI/TR—8104-2-T4)

Joint Center for Graduate Study, Richland, WA (USA)
Investigation of solar cells based on Cu_2O. Third quarterly report, 1 December 1980-28 February 1981, 6:26996 (SERI/PR—9190-1-T2)

K

Kaiser Engineers, Oakland, CA (USA)
Feasibility study for industrial utilization of waste derived fuel gas. Task I; step 1; subtask B(1) working paper, 6:27341 (DOE/CS/20030—T2)

Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.)
Synthetic fuels: status and directions. Volume 1. Sections 1-17. Conference proceedings, 6:27241 (EPRI-WS—79-238(Vol.1))

Korea Inst. of Science and Technology, Seoul (Republic of Korea)
Development of a tubular lithium-iron sulfide cell, 6:27210 (CONF-800806—47)

L

Lawrence Berkeley Lab., CA (USA)
Continuum gamma-ray spectroscopy, 6:27925 (LBL—12792)
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Theoretical and observational analysis of individual ionizing particle effects in biological tissue, 6:27767 (LBL—11147-Rev.)

Lawrence Livermore National Lab., CA (USA)
Automatic test system for CCDs, 6:27553 (UCID—19077)
Bound water in Kevlar 49 fibers, 6:27419 (UCRL—85838)
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Engineering Research Division publication report, calendar year 1980, 6:27554 (UCID—19080-80)
Final transport of heavy-ion beams for inertial-confinement fusion, 6:28008 (UCRL—85689)
Fluid and structural dynamic design considerations of the HYLIFE nozzle plate, 6:28003 (UCRL—84874)
Flywheels: mobile applications, 6:27347 (UCRL—15363)
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Gamma-ray spectra from neutron capture on ^{87}Sr, 6:27924 (UCID—19083)
Improved fluid-structure coupling, 6:27182 (UCRL—84887)
Lawrence Livermore National Laboratory oil shale project. Quarterly report, January-March 1981, 6:26864 (UCID—16986-81-1)
Linear array synthesis via a constrained version of Prony's method, 6:27619 (UCRL—86288)
Mirror fusion. Quarterly report, October-December 1980, 6:28000 (UCAR—10060-80-4)
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Lehigh Univ., Bethlehem, PA (USA). Sherman Fairchild Lab.
Stability studies of the chlorine containing phase at the SiO_2/Si interface produced by HCl/O_2 oxidation of silicon, 6:27455 (BNL—29634)

Little (Arthur D.), Inc., Cambridge, MA (USA)
Development of a high efficiency, automatic defrosting refrigerator-freezer, 6:27304 (CONF-810697—1)

Lockheed Missiles and Space Co., Inc., Sunnyvale, CA (USA)
Laser annealing of ion-implanted CZ silicon for solar-cell-junction formation. Final report, 6:26992 (DOE/JPL/955696—81/4)

Los Alamos National Lab., NM (USA)
Application of cryogenic spectroscopy to the determination of impurity concentration in coal gasifiers, 6:27438 (LA-UR—81-1736)
Automated activation-analysis system, 6:27439 (LA-UR—81-1810)
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Comparison of materials accounting in conversion and coconversion processes, 6:26930 (LA-UR—81-1950)
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Laboratory studies of radionuclide distributions between selected groundwaters and geologic media. Progress report, January 1-March 31, 1981, 6:26903 (LA—8818-PR)
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Los Alamos Scientific Lab., NM (USA)
Envelope ionization mechanisms and BW Vulpeculae, 6:27831 (LA-UR—81-1909)
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Los Alamos Critical Assemblies Facility, 6:27161 (LA—8762-MS)
Research and development related to the Nevada Nuclear Waste Storage Investigations. Progress report, January 1-March 31, 1981, 6:26905 (LA—8847-PR)
Solar-thermal hydrogen production, 6:26956 (LA-UR—81-1730)

Louisiana Dept. of Natural Resources, Baton Rouge (USA)
Workshop on subsurface disposal of geopressured fluids, Gulf Coast: proceedings, 6:27078 (DOE/ET/27085—1(Add.))

Louisiana State Univ., Baton Rouge (USA)
Workshop on subsurface disposal of geopressured fluids, Gulf Coast: proceedings, 6:27078 (DOE/ET/27085—1(Add.))

M

Management and Technical Services Co., Philadelphia, PA (USA)
Operation, maintenance and modification of DOE/PETC two stage MHD pressurized coal combustor. Final activity report, July 1976-November 15, 1980, 6:27280 (DOE/PC/04049—T1)

Martin Marietta Corp., Denver, CO (USA)
Solar central receiver hybrid power system. Phase I, 6:27020 (MCR—79-1333)

Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)
Evaluation of machining safety: PBX 9404 and LX-10. Process development: Endeavor No. 301, 6:27627 (MHSMP—81-31)

Massachusetts Inst. of Tech., Oak Ridge, TN (USA). School of Chemical Engineering Practice
Economic evaluation of neutral-solvents fermentation product separation, 6:26971 (ORNL/MIT—330)

Massachusetts Univ., Amherst (USA)
Polymer-filler studies, 6:27418 (UCRL—15362)

McDonnell Douglas Astronautics Co., Huntington Beach, CA (USA)
Collector-field optimization report (RADL item 2-25), 6:27022 (SAN—0499-22)

McDonnell Douglas Electronics Co., St. Charles, MO (USA)
Built-in Test Equipment (BITE) to improve front-end-loader productivity. Technical progress report, 6:26805 (DOE/ET/14052—1)
Development of operational aids for improved dragline utilization. Final technical report, May 30, 1981, 6:26804 (DOE/ET/12201—T1)

Miami Univ., FL (USA). Div. of Meteorology and Physical Oceanography
Measurement of Gulf-Stream and wind-induced shelf circulation in the South Atlantic Bight. Progress report, June 1, 1980-May 31, 1981, 6:27659 (DOE/EV/05163—4)

Mississippi State Univ., Mississippi State (USA). Engineering and Industrial Research Station
Initial UTSI-MSU cooperative application of line-reversal instrumentation in a coal-fired MHD combustor, 6:27278 (DOE/ET/10815—T5)

Mitre Corp., McLean, VA (USA). METREK Div.
Environmental effects of coal technologies: research needs, 6:26801 (MTR—79W-159-03)

Mound Facility, Miamisburg, OH (USA)
Application of the controllable unit approach (CUA) to a low enrichment uranium fuel facility, 6:26934 (MLM—2845-OP)
Test and evaluation of an Argonne National Laboratory bulk assay calorimeter, 6:27618 (MLM—2839)

N

National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center
Compatibility of alternative fuels with advanced automotive gas-turbine and Stirling engines. A literature survey, 6:27348 (DOE/NASA/51040—24)
Heat storage in alloy transformations. Final report, 6:27208 (DOE/NASA/3184—2)
High-temperature alkali corrosion in high-velocity gases, 6:26746 (DOE/NASA/2593—28)
Solar thermal power systems: parabolic dish project. Annual technical report, Fiscal Year 1980, 6:27019 (DOE/JPL—1060-45)

National Aeronautics and Space Administration, Pasadena, CA (USA)
Proceedings of the 17th project integration meeting. Progress report 17, September 1980-February 1981, 6:26990 (DOE/JPL—1012-54)

National Bureau of Standards, Washington, DC (USA). Center for Fire Research
Fire safety of wood-burning appliances, Part 1: state of the art review and fire tests. Volume 1, 6:27310 (NBSIR—80-2140-Vol.1)

National Coal Board, Leatherhead (UK). Coal Utilization Research Lab.
Pressurized fluidized bed-combustion part-load behavior. Volume II. Test 1 results, 6:27559 (DOE/MC/14129—172)
Pressurized fluidized-bed combustion. Volume III. Test 2 results, 6:27560 (DOE/MC/14129—173)
Pressurized fluidized-bed combustion part-load behavior. Volume IV. Test 3 results, 6:27561 (DOE/MC/14129—174)

Naval Air Systems Command, Washington, DC (USA)
Advanced composite aircraft electromagnetic design and synthesis, 6:27615 (SAND—81-1278C)

Naval Research Lab., Washington, DC (USA)
Injection of intense pulsed-ion beams into tokamaks with application to plasma heating and current maintenance, 6:27964 (NRL—8482)
Study of $Eu_{1.2}Mo_6S_8$ under high pressure and high magnetic field, 6:27946 (LA-UR—81-1013)

Nevada Univ., Las Vegas (USA). Desert Research Inst.
Some statistical aspects of characterizing the distribution of radionuclides in the environment, 6:26927 (CONF-810678—1)

Nevada Univ., Reno (USA). Water Resources Center
Radiological characterization of the Kellex site. Publication No. 45020, 6:27657 (DOE/DP/01253—20)

New Hampshire Univ., Durham (USA). Dept. of Chemical Engineering
Solar-enhanced coal gasification using high-temperature solar energy, 6:27037 (CONF-801264—1)

New Mexico State Univ., Las Cruces (USA). Dept. of Chemical Engineering
CO_2 formation damage study. First annual report, 6:26835 (DOE/MC/10865—6)

New Mexico Univ., Albuquerque (USA)
Hardware implementation of a discrete-time analog adaptive filter, 6:27551 (SAND—81-1378C)
Synthesize and evaluate laser dyes for LASL. Final report, 6:27543 (DOE/ER/13581—T1)

New Mexico Univ., Albuquerque (USA). Dept. of Chemical and Nuclear Engineering
Methane recovery from New Mexico coals, 6:26856 (NP—1903585)

New York Univ., NY (USA)
Fluid dynamics of a fluidized bed packed with heat exchangers. Final report, 6:27562 (DOE/MC/14322—168)
Northeast Solar Energy Center, Boston, MA (USA)
Review of solar-market studies, 6:26982 (NESEC—5)
Northeast Solar Energy Center, Cambridge, MA (USA)
Report on the solar assessment of non-federal public buildings in the Northeast Region. Final report, 6:27041 (DOE/CS/30149—T1)
Nor'West-Pacific Corp., Seattle, WA (USA)
Feasibility study for a forest-residue-fueled electric-generating plant. Final report, May 1981, 6:27106 (EPRI-CS—1819)

O

Oak Ridge Associated Universities, Inc., TN (USA)
Consolidated fuel-reprocessing program:: man/machine interface development for the REMOTEX concept, 6:26893 (CONF-810691—1)
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Application of laser annealing and laser-induced diffusion to photovoltaic conversion, 6:26987 (CONF-810690—1)
AR and TD Fossil Energy Materials Program. Quarterly progress report for the period ending March 31, 1981, 6:26759 (ORNL/FMP—81/2)
Behavior of graphite during rapid depressurization, 6:27163 (CONF-810604—5)
Chemistry and mutagenicity of shale oil, 6:26867 (CONF-810676—1)
Compressor-simulation model with corrections for the level of suction gas superheat, 6:27299 (CONF-810657—2)
Consolidated fuel-reprocessing program:: man/machine interface development for the REMOTEX concept, 6:26893 (CONF-810691—1)
Constitutive equations for meeting elevated-temperature-design needs, 6:27143 (CONF-810625—20)
Consumer choice and market penetration of new technologies: application of a discrete-choice model. Final report. CRA report No. 423, 6:27223 (ORNL/Sub—80/45734/1)
Contribution of residential wood combustion to local airshed pollutant concentrations, 6:27633 (CONF-810674—1)
Corrosion and stress corrosion cracking in coal liquefaction processes, 6:26737 (CONF-8005172—1)
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First piezoelectric detection of optoacoustic spectra at cryogenic temperatures: cubic neodymium sesquioxide below 10K, 6:27402 (CONF-810630—7)
Fossil Energy Program. Progress report for April 1981, 6:26735 (ORNL/TM—7826)
Fossil energy program. Progress report for May 1981, 6:26736 (ORNL/TM—7865)
Fossil Energy Program. Quarterly progress report for the period ending March 31, 1981, 6:26734 (ORNL—5773)
Hydroelectric operation at the river basin level: research needs to include ecological issues in basin-level hydropower planning. Environmental Sciences Division Publication No. 1726, 6:26977 (EPRI-WS—80-155)
Incorporating civil-defense shelter space in new underground construction, 6:28027 (CONF-810671—1)
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Use of run statistics to validate tensile tests, 6:27420 (CONF-810604—3)
OMB Associates, Oakland, CA (USA)
Environmental implications of the large-scale utilization of alcohol fuels in the United States, 6:27319 (CONF-8010194—1)

P

Pennsylvania State Univ., University Park (USA)
Use of stack air in production cupolas and the transfer of the technology in the foundry industry. Annual technical progress report, January 1-December 31, 1980, 6:27557 (DOE/CS/40028—T1)
Pennsylvania Univ., Philadelphia (USA). School of Public and Urban Policy
Economic analysis of geopressured resources: site specific consideration of geopressured methane gas at Brazoria. Final report, 1 March 1980-28 February 1981, 6:27077 (DOE/NV/10089—1)
Pittsburgh Univ., PA (USA)
I. Charge exchange collisions of highly stripped ions with atomic hydrogen. II. Development of a three-stage double tandem accelerator-decelerator system for low energy, highly stripped ions. Final report, March 1, 1977-May 30, 1981, 6:27861 (DOE/ER/04257—T2)

Plasma Physics Corp., Locust Valley, NY (USA)
Plasma-assisted CVD of fluorinated, hydrogenated amorphous silicon. Final report, 6:27000 (SERI/TR—8041-2-T2)
Potomac Electric Power Co., Washington, DC (USA)
Preliminary design study of underground pumped hydro and compressed-air energy storage in hard rock. Volume 4. System planning studies. Final report, 6:27187 (EPRI-EM—1589(Vol.4))
Power Technologies, Inc., Schenectady, NY (USA)
Fundamental optimization study for open-wire transmission systems, 6:27130 (DOE/CE/29325—1)
Princeton Univ., NJ (USA). Plasma Physics Lab.
Analytical theory of interchange and compressional Alfven instabilities in EBT, 6:27968 (PPPL—1810)
Central helium density measurements in PLT, 6:27970 (PPPL—1813)
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Turbulent polarization terms and Balescu-Lenard operator, 6:27967 (PPPL—1805)
Pritchard (J.F.) and Co., Kansas City, MO (USA)
Evaluation of the use of UCG gas to produce 4000 BPD and 12,000 BPD of methanol with conversion to M-gasoline, 6:26777 (DOE/ET/14372—T1)

Q

QEB, Inc., Lakewood, CO (USA)
Airborne gamma-ray spectrometer and magnetometer survey: Miles City quadrangle (Montana). Final report, 6:26879 (GJBX—180-81-Vol.2B)
Airborne gamma-ray spectrometer and magnetometer survey: Watford City quadrangle (North Dakota). Final report, 6:26880 (GJBX—180-81-Vol.2D)
Airborne gamma-ray spectrometer and magnetometer survey: Aurora quadrangle (IL). Final report, 6:26884 (GJBX—181-81-Vol.2C)
Airborne gamma-ray spectrometer and magnetometer survey: Madison quadrangle (WI). Final report, 6:26882 (GJBX—181-81-Vol.2A)
Airborne gamma-ray spectrometer and magnetometer survey: Rockford quadrangle (IL). Final report, 6:26883 (GJBX—181-81-Vol.2B)

R

Radiation Monitoring Devices, Inc., Watertown, MA (USA)
High efficiency thin film CdTe solar cells. Final progress report, April 1, 1980 to March 31, 1981, 6:27002 (SERI/TR—9133-1-T2)
Rensselaer Polytechnic Inst., Troy, NY (USA)
Advanced development of particle-beam-probe diagnostic systems. Technical progress report, 1 July 1980-30 April 1981, 6:27959 (DOE/ET/53004—20)
Research Triangle Inst., Research Triangle Park, NC (USA)
Vegetable oils as an on the farm diesel fuel substitute: the North Carolina situation. Final report, 6:26993 (NCEI—0032)
Rijksuniversiteit Groningen (Netherlands). Kernfysisch Versneller Inst.
Test the interacting boson model by pion-nucleus inelastic scattering, 6:27882 (CONF-8006127—5)
Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group
Coal-hydrogasification process development. Quarterly technical progress report, April 1-June 30, 1981, 6:26741 (DOE/ET/10328—33)
Helium generation in fusion reactor materials. Progress report, October-December 1980, 6:27990 (DOE/ET/52015—T16)
Solar central receiver hybrid power system. Monthly technical progress report, March 1979, 6:27016 (DOE/ET/20567—T2)
Solar central receiver hybrid power system. Monthly technical progress report for the month of December 1978, 6:27018 (DOE/ET/20567—T4)
Solar central receiver hybrid power system. Monthly technical progress report, February 1979, 6:27017 (DOE/ET/20567—T3)
Rockwell International Corp., Golden, CO (USA). Energy Systems Group
Criticality alarm system for plutonium process operations, 6:27537 (RFP—3056)
Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant
Absorption spectrophotometric characterization of Sm(II), Sm(III), and Sm(II/III) bromides and Sm(III) oxybromide in the solid state, 6:27487 (CONF-810675—1)
Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations
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Rocky Mountain Pipeline Co., San Francisco, CA (USA)
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Improved pressure coring system. Annual report, October 1, 1979-September 30, 1980, 6:26833 (DOE/BC/00034—21A)
Instruction manual for Sandia's laser tracker. Volume 1, 6:27539 (SAND—80-2049/1)
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The title may be supplemented with additional words, or a phrase, if it appears additional information would be helpful. In cases for which the title contains little or no information related to the subject entry, it may be replaced entirely by the supplementary information. A qualifier is not always required, and in such cases the title will follow the unqualified subject descriptor.

The descriptors selected for use as subject terms are generally the names of specific materials, things, or processes. To the extent possible, a qualifier is selected to describe the properties of, or processses applied to, the subject term.

Index entries are selected to indicate the important ideas and concepts presented in a document, rather than words that may appear in the text. Within the available thesaurus terms, the most probable or logical place to look for typical information is selected. "See references" are included to guide users from synonymous terms or phrases to the descriptor selected as a subject heading for the concept. (e.g. Pipeline Quality Gas see HIGH BTU GAS). "See also references" are used to indicate where to find references to subject concepts that are narrower, broader, or related to a particular subject heading. To complete an exhaustive search of a given subject, all such headings should be reviewed.

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CONF-790447-		(Health implications of the new energy technologies, Park City, UT, USA, 4-7 Apr 1979)
	6:27812	Ann Arbor, MI; Ann Arbor Science Publishers, Inc. (1980).
CONF-790727-		(IIASA-RSI conference on systems aspects of energy and mineral resources, Laxenburg, Austria, 9-14 Jul 1979)
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(Summ.)	6:27219	Honolulu, Hawaii; East-West Environment and Policy Institute (1981).
CONF-8003142-		(Pacific Coast Gas Association operating section transmission conference, Salt Lake City, UT, USA, 31 Mar-1 Apr 1980)
5	6:26859	El Paso, TX; El Paso Natural Gas Company (1980).
CONF-8005165-		(Symposium on non-technical obstacles to the use of solar energy, Brussels, Belgium, 20-22 May 1980)
	6:27254	New York, NY; Harwood Academic Publishers (1980).
CONF-8005172-		(Canadian council of ASM conference on materials to satisfy the energy demand, Harrison, UK, 11-16 May 1980)
1	6:26737	NTIS, PC A04/MF A01. Distribution Category MN -90d
CONF-800643-		(14. annual conference on trace substances in environmental health, Columbia, MO, USA, 2 Jun 1980)
	6:27730	Columbia, MO; University of Missouri (1980).
CONF-8006116-		(Conference on chemistry and physics of coal utilization, Morgantown, WV, USA, 4 Jun 1980)
	6:26765	AIP Conf. Proc., 70: No. 1, 256-290(1 Feb 1981)
	6:26766	AIP Conf. Proc., 70: No. 1, 291-308(1 Feb 1981)
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	6:26768	AIP Conf. Proc., 70: No. 1, 357-387(1 Feb 1981)
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	6:26784	AIP Conf. Proc., 70: No. 1, 28-48(1 Feb 1981)
	6:26785	AIP Conf. Proc., 70: No. 1, 66-81(1 Feb 1981)
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	6:26787	AIP Conf. Proc., 70: No. 1, 154-167(1 Feb 1981)
	6:26808	AIP Conf. Proc., 70: No. 1, 198-208(1 Feb 1981)
CONF-8006127-		(International conference on interacting bose-fermi systems in nuclei, Erice, Sicily, Italy, 12-19 Jun 1980)
5	6:27882	NTIS, PC A02/MF A01. Order Number DE81023525, Distribution Category MN -34D
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CONF-800707-		(8. international conference on plasma physics and controlled nuclear fusion research, Brussels, Belgium, 1-10 Jul 1980)
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CONF-800775-		(International DUMAND symposium, Honolulu, HI, USA, 24 Jul-2 Aug 1980)
(Vol.1)	6:27582	Honolulu, HI; Hawaii DUMAND Center (1981).
(Vol.2)	6:27609	Honolulu, HI; Hawaii DUMAND Center (1981).
CONF-8007103-		(Industrial chemistry session-modern engineering and technology seminar, Taipei, Taiwan, 7-25 Jul 1980)
1	6:27211	NTIS, PC A03/MF A01. Order Number DE81023530, Distribution Category MN -94c
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CONF-8007108-		(Topical conference on thermally grown oxides on silicon, Berkeley, CA, USA, 28-30 Jul 1980)
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CONF-800890-		(Insulation resource assessment program contractors annual review, Davis, CA, USA, 19-21 Aug 1980)
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CONF-8008108-		(International symposium on physics of ionized gases, Dubrovnik, Yugoslavia, 23-28 Aug 1980)
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CONF-800980-		(Applied superconductivity conference, Santa Fe, NM, USA, 29 Sep-2 Oct 1980)
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CONF-8009156-		(Symposium on perspectives in electro-and photo-nuclear physics, Saclay, France, 29 Sep-3 Oct 1980)
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CONF-801019-		(1. International Energy Agency symposium of the air infiltration centre, Windsor, UK, 6-8 Oct 1980)
2	6:27309	*See* LBL-10852
CONF-801055-		(5. annual thermal storage meeting, McLean, VA, USA, 10-15 Oct 1980)
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	6:27068	NTIS, PC A16/MF A01
	6:27189	NTIS, PC A16/MF A01. Distribution Category STD -94a
	6:27190	NTIS, PC A16/MF A01
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	6:27456	NTIS, PC A16/MF A01
CONF-8010103-		(LOFT/utility technology transfer meeting, Idaho Falls, ID, USA, 16-17 Oct 1980)
7	6:27164	*See* CONF-810803-1
CONF-8010130-		(Waste-Rock Interactions Technology annual information meeting, Seattle, WA, USA, 13-15 Oct 1980)
7	6:26897	NTIS, PC A02/MF A01. Order Number DE81023841, Distribution Category MN -70
CONF-8010146-		(Utilities and energy efficiency: new opportunities and risk, Port Chester, NY, USA, 23-24 Oct 1980)
	6:27224	NTIS, PC A08/MF A01
	6:27225	NTIS, PC A08/MF A01
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	6:27229	NTIS, PC A08/MF A01. Distribution Category MN -95a
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	6:27305	NTIS, PC A08/MF A01
CONF-8010150-		(Conference on synthetic fuels: status and directions, San Francisco, CA, USA, 13-16 Oct 1980)
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CONF-8010172-		(2. annual Pacific Northwest alternative and renewable energy resources conference, Portland, OR, USA, 27-28 Oct 1980)
	6:26976	*See* DOE/BP-38
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	6:27040	*See* DOE/BP-38
	6:27252	*See* DOE/BP-38
CONF-8010193-		(Commission of the European Communities international conference on energy planning, Brussels, Belgium, 21-23 Oct 1980)
1	6:27290	NTIS, PC A03/MF A01. Order Number DE81023814, Distribution Category MN -98F
CONF-8010194-		(4. international symposium on alcohol fuels technology, Guaruja, Brazil, Oct 1980)
1	6:27319	NTIS, PC A02/MF A01. Order Number DE81023906, Distribution Category MN -61a
CONF-8010195-		(Annual conference of the American Water Resource Association, Minneapolis, MN, USA, 12-15 Oct 1980)
1	6:27692	NTIS, PC A02/MF A01. Order Number DE81023829, Distribution Category MN -11
CONF-8010198-		(Conference on climate and offshore energy resources, London, UK, 21-23 Oct 1980)
1	6:27029	NTIS, PC A02/MF A01. Order Number DE81023916, Distribution Category MN -64
CONF-8010201-		(Workshop on deposition in utility gas turbines, Palo Alto, CA, USA, 30-31 Oct 1980)
	6:27109	*See* EPRI-WS-80-121
CONF-8010202-		(Inhalation toxicology symposium, Kalamazoo, MI, USA, 15-16 Oct 1980)
1	6:27766	*See* LA-UR-81-963
CONF-8010205-		(3. international symposium on molten salts, Hollywood, FL, USA, Oct 1980)
1	6:27503	NTIS, PC A03/MF A01. Order Number DE81023907, Distribution Category MN -4
CONF-801223-		(2. wind energy innovative systems conference, Colorado Springs, CO, USA, 3-5 Dec 1980)
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CONF-801227-		(Atomic and nuclear methods in fossil energy research meeting, Mayaguez, Puerto Rico, 1-4 Dec 1980)
4	6:26779	*See* DOE/EV/10403-1
CONF-801261-		(National telecommunications conference, Houston, TX, USA, 3 Dec 1980)
1	6:27762	NTIS, PC A02/MF A01. Order Number DE81023811, Distribution Category MN -11
CONF-801264-		(National Solar Energy Convention, Annamalainagar, India, Dec 1980)
1	6:27037	NTIS, PC A02/MF A01. Order Number DE81025020, Distribution Category MN -59b
CONF-810137-		(Solar thermal test facility (STTF) workshop: STTF testing for long-term system performance, Albuquerque, NM, USA, 7-9 Jan 1981)
2	6:26956	*See* LA-UR-81-1730
CONF-810147-		(Simposio La Obsidiana en Mesoamerica, Pachuca, Mexico, 26-31 Jan 1981)
1	6:27827	*See* BNL-29656
CONF-810247-		(ICN-UCLA symposia on mechanisms in chemical carcinogenesis, Keystone, CO, USA, 22 Feb-1 Mar 1981)
2	6:27763	NTIS, PC A03/MF A01. Order Number DE81023229, Distribution Category MN -48
CONF-810255-		(Project integration meeting, Pasadena, CA, USA, 4-5 Feb 1981)
	6:26990	*See* DOE/JPL-1012-54
CONF-810256-		(AIME annual meeting, Chicago, IL, USA, 2 Feb 1981)
1	6:27993	*See* HEDL-SA-2331-FP
CONF-810308-		(American Chemical Society symposium on the chemistry of engine combustion deposits, Atlanta, GA, USA, 29 Mar-3 Apr 1981)
(Vol.4)	6:26778	Am. Chem. Soc., Div. Fuel Chem., Prepr., 26: No. 2, 100-106(29 Mar 1981)
CONF-810314-		(Particle accelerator conference, Washington, DC, USA, 11-13 Mar 1981)
105	6:27566	*See* LA-UR-81-780
164	6:27574	*See* LBL-12268
CONF-810341-		(ASCE spring conference, Las Cruces, NM, USA, 27 Mar 1981)
1	6:27061	*See* SAND-80-7076
CONF-810351-		(INS meeting on nuclear radiation detectors, Tokyo, Japan, 23-26 Mar 1981)
4	6:27571	*See* BNL-29647
CONF-810353-		(Solar desalination workshop, Denver, CO, USA, 23-25 Mar 1981)
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CONF-810364-		(International school of fusion reactor technology's course on unconventional approaches to fusion, Erice, Italy, 16-27 Mar 1981)
2	6:27958	NTIS, PC A02/MF A01. Order Number DE81023133, Distribution Category MN -20
CONF-810376-		(16. rencontre de moriond: nonperturbative QCD: theory and experiment, Les Arcs, France, 15-27 Mar 1981)
2	6:27883	*See* SLAC-PUB-2721
CONF-810378-		(12. lunar and planetary science conference, Houston, TX, USA, 16-20 Mar 1981)
2	6:27830	*See* LA-UR-81-1875
CONF-810384-		(2. annual grain alcohol production and utilization conference, Lincoln, NB, USA, 12-13 Mar 1981)
	6:27007	Lincoln, NE; Agricultural Products Industrial Utilization Committee (1981).
CONF-810402-		(Corrosion/81 annual meeting, Toronto, Canada, 6-10 Apr 1981)
11	6:26937	*See* HEDL-SA-2343-FP
CONF-810429-		(Conference on optics, Santa Fe, NM, USA, 6-10 Apr 1981)
35	6:27617	*See* LA-UR-81-1808
36	6:27863	*See* LA-UR-81-1690
CONF-810468-		(3. international conference on electrostatic accelerator technology, Oak Ridge, TN, USA, 13-16 Apr 1981)
8	6:27570	*See* BNL-29613
CONF-810493-		(AMS/CMOS conference on long-range transport of airborne pollutants, Albany, NY, USA, 27-30 Apr 1981)
1	6:27760	*See* BNL-29549
CONF-810495-		(Interdisciplinary surface science conference, Liverpool, UK, 6-9 Apr 1981)
1	6:27948	*See* SLAC-PUB-2716
CONF-810496-		(4. international colloquium on photon-photon interactions, Paris, France, 6-9 Apr 1981)
1	6:27892	*See* SLAC-PUB-2733
CONF-810509-		(Annual conference of the International Solar Energy Society, Philadelphia, PA, USA, 26-30 May 1981)
31	6:27227	*See* LA-UR-81-1202
CONF-810518-		(Joint SPE/DOE symposium, Denver, CO, USA, 27-29 May 1981)
8	6:26855	*See* LA-UR-81-1827
9	6:26857	*See* UCRL-84988
CONF-810526-		(15. IEEE PV specialists conference, Orlando, FL, USA, 11-15 May 1981)
31	6:26997	*See* SERI/TP-613-1220
34	6:26998	*See* SERI/TP-613-1224
CONF-810527-		(International conference on plasma science, Sante Fe, NM, USA, 18-20 May 1981)
5	6:28009	*See* UCRL-86019
CONF-810528-		(83. symposium on nucleation and crystallization in glasses, Washington, DC, USA, 3-6 May 1981)
7	6:26902	*See* HEDL-SA-2235
CONF-810539-		(Conference on the application of microprocessors to high energy physics experiments, Geneva, Switzerland, 4-6 May 1981)
5	6:28021	*See* SLAC-PUB-2728
6	6:27580	*See* SLAC-PUB-2726
7	6:27576	*See* SLAC-PUB-2723
CONF-810542-		(Joint meeting of the Institute of Management Sciences and Operations Research Society, Toronto, Canada, 6 May 1981)
4	6:27291	*See* BNL-29606
CONF-810566-		(International conference on fast ionic transport in solids, Gatlinburg, TN, USA, 18-22 May 1981)
4	6:27281	*See* BNL-29628
CONF-810586-		(Argonne symposium on high energy spectrometry, Argonne, IL, USA, 11-13 May 1981)
2	6:27575	*See* LBL-12846
CONF-810588-		(DOE/NBS workshop on environmental speciation and monitoring needs, Gaithersburg, MD, USA, 18-20 May 1981)
1	6:27727	NTIS, PC A02/MF A01. Order Number DE81024970, Distribution Category MN -4
CONF-810592-		(9. annual conference and international trade fair National Water Supply Improvement Association, Washington, DC, USA, 31 May-4 Jun 1981)
1	6:27693	*See* HEDL-SA-2370-FP
CONF-810599-		(4. standards conference, Rochester, NY, USA, 12-15 May 1981)
1	6:28022	*See* SLAC-PUB-2735
CONF-8105102-		(International symposium on osteoporosis, Jerusalem, Israel, 31 May-5 Jun 1981)
1	6:27719	*See* BNL-29673
CONF-810604-		(15. biennial conference on carbon, Philadelphia, PA, USA, 22-26 Jun 1981)
3	6:27420	NTIS, PC A02/MF A01. Order Number DE81024120, Distribution Category MN -25
4	6:27421	NTIS, PC A02/MF A01. Order Number DE81024117, Distribution Category MN -25
5	6:27163	NTIS, PC A02/MF A01. Order Number DE81024251, Distribution Category MN -77
6	6:27422	NTIS, PC A02/MF A01. Order Number DE81024119, Distribution Category MN -25
CONF-810607-		(Symposium on instrumentation and control for fossil energy processes, San Francisco, CA, USA, 8-12 Jun 1981)
9	6:27438	*See* LA-UR-81-1736
CONF-810620-		(4. international topical conference on high-power electron and ion-beam research and technology, Palaiseau, France, 29 Jun-3 Jul 1981)
5	6:27567	*See* UCRL-85652
6	6:28008	*See* UCRL-85689

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CONF-810621-	(Symposium on fluid mechanics of combustion systems, Boulder, CO, USA, 22-24 Jun 1981)	
3	6:27949	NTIS, PC A02/MF A01. Order Number DE81024118, Distribution Category MN -32
CONF-810623-	(24. midwest symposium on circuits and systems, Albuquerque, NM, USA, 29-30 Jun 1981)	
5	6:28017	*See* LA-UR-81-1959
6	6:26929	*See* LA-UR-81-1729
7	6:28020	*See* SAND-81-1543c
8	6:26935	*See* SAND-81-0517C
9	6:27185	*See* LA-UR-81-1902
10	6:27551	*See* SAND-81-1378C
CONF-810624-	(22. US symposium on rock mechanics, Cambridge, MA, USA, 29 Jun-2 Jul 1981)	
8	6:27826	*See* LBL-11953
CONF-810625-	(ASME PVP conference, Denver, CO, USA, 21-26 Jun 1981)	
19	6:27142	NTIS, PC A02/MF A01. Order Number DE81023934, Distribution Category MN -79p
20	6:27143	NTIS, PC A03/MF A01. Order Number DE81023935, Distribution Category MN -79r
CONF-810630-	(2. international photoacoustic spectroscopy conference, Berkeley, CA, USA, 22-25 Jun 1981)	
7	6:27402	NTIS, PC A02/MF A01. Order Number DE81024130, Distribution Category MN -38
CONF-810631-	(74. annual meeting of the Air Pollution Control Association, Philadelphia, PA, USA, 21-26 Jun 1981)	
4	6:27110	NTIS, PC A02/MF A01. Order Number DE81024087, Distribution Category MN -93
CONF-810640-	(17. State-of-the-art symposium, Washington, DC, USA, 8-10 Jun 1981)	
2	6:27546	*See* LA-UR-81-1734
CONF-810651-	(1981 topical conference on low-energy X-ray diagnostics, Livermore, CA, USA, 8-10 Jun 1981)	
2	6:27865	*See* UCRL-85683
CONF-810652-	(International symposium on health impacts of different sources of energy, Nashville, TN, USA, 22-26 Jun 1981)	
6	6:27761	*See* BNL-29610
CONF-810657-	(ASHRAE 1981 annual meeting, Cincinnati, OH, USA, 28 Jun-2 Jul 1981)	
2	6:27299	NTIS, PC A02/MF A01. Order Number DE81023954, Distribution Category MN -95d
CONF-810658-	(11. biennial lignite symposium, San Antonio, TX, USA, 15 Jun 1981)	
1	6:27235	NTIS, PC A02/MF A01. Order Number DE81025685, Distribution Category MN -98A
CONF-810659-	(3. IEEE international pulsed power conference, Albuquerque, NM, USA, 1-3 Jun 1981)	
10	6:27997	*See* SAND-81-0753C
11	6:27999	*See* SAND-81-1382C
12	6:27549	*See* LA-UR-81-1666
14	6:27550	*See* LA-UR-81-1670
17	6:27548	*See* LA-UR-81-1553
19	6:27616	*See* LA-UR-81-1665
CONF-810665-	(Plasma-materials development workshop, Albuquerque, NM, USA, 24-25 Jun 1981)	
1	6:27987	NTIS, PC A02/MF A01. Order Number DE81023549, Distribution Category MN -20c
CONF-810671-	(Underground space conference and exposition, Kansas City, KS, USA, 8-10 Jun 1981)	
1	6:28027	NTIS, PC A03/MF A01. Order Number DE81023212, Distribution Category MN -41
CONF-810672-	(DOE heat pump contractors' program integration meeting, McLean, VA, USA, 2-4 Jun 1981)	
8	6:27300	NTIS, PC A02/MF A01. Order Number DE81024138, Distribution Category MN -95d
12	6:27301	NTIS, PC A02/MF A01. Order Number DE81024099, Distribution Category MN -95d
15	6:27302	NTIS, PC A02/MF A01. Order Number DE81024134, Distribution Category MN -95d
17	6:27038	NTIS, PC A02/MF A01. Order Number DE81023221, Distribution Category MN -94a
18	6:27303	NTIS, PC A02/MF A01. Order Number DE81024982, Distribution Category MN -95e
21	6:27292	*See* BNL-29676
23	6:27035	*See* BNL-29681
24	6:27034	*See* BNL-29679
CONF-810674-	(1981 international conference on residential solid fuels, Portland, OR, USA, 1-5 Jun 1981)	
1	6:27633	NTIS, PC A02/MF A01. Order Number DE81023222, Distribution Category MN -11
CONF-810675-	(15. rare earth research conference, Rolla, MO, USA, 15-18 Jun 1981)	
1	6:27487	NTIS, PC A02/MF A01. Order Number DE81023215, Distribution Category MN -4
CONF-810676-	(2. joint US-USSR workshop on the health and environmental effects of oil shale development, Tallinn, USSR, 22-27 Jun 1981)	
1	6:26867	NTIS, PC A02/MF A01. Order Number DE81023196, Distribution Category MN -91
CONF-810678-	(IMS/WNAR conference, Victoria, BC, Canada, 15-17 Jun 1981)	
1	6:26927	NTIS, PC A02/MF A01. Distribution Category MN -11
CONF-810682-	(6. international conference: Modern trends in activation analysis, Toronto, Canada, 15-19 Jun 1981)	
2	6:27433	NTIS, PC A02/MF A01. Order Number DE81024964, Distribution Category MN -4
4	6:27434	NTIS, PC A02/MF A01. Order Number DE81023208, Distribution Category MN -4
6	6:27439	*See* LA-UR-81-1810
CONF-810683-	(International joint conference on thermophysical properties, Gaithersburg, MD, USA, 15-19 Jun 1981)	
1	6:27951	*See* SAND-81-2601C
4	6:27358	*See* LA-UR-81-1811
CONF-810684-	(APS conference on shock waves in condensed matter, Menlo Park, CA, USA, 23-25 Jun 1981)	
20	6:27998	*See* SAND-81-1329C
21	6:27360	*See* LA-UR-81-1824
22	6:27626	*See* LA-UR-81-1870
23	6:27625	*See* LA-UR-81-1725
26	6:27541	*See* SAND-81-1369C
27	6:27359	*See* LA-UR-81-1816
28	6:27412	*See* SAND-81-1456C
30	6:27940	*See* LA-UR-81-1896
31	6:27361	*See* LA-UR-81-1889
40	6:27388	*See* UCRL-86301
CONF-810687-	(US/USSR workshop on carbon dioxide and climate, Leningrad, USSR, 15-19 Jun 1981)	
2	6:27631	*See* UCRL-85753
CONF-810688-	(American Computing Machinery special interest group on computer personnel research conference, Washington, DC, USA, 4-6 Jun 1981)	
1	6:28018	*See* LBL-12578
CONF-810690-	(Polycrystalline silicon subcontractors' review meeting, Alexandria, VA, USA, 17-19 Jun 1981)	
1	6:26987	NTIS, PC A02/MF A01. Order Number DE81024125, Distribution Category MN -63a
CONF-810691-	(17. annual conference on manual control, Los Angeles, CA, USA, 16-18 Jun 1981)	
1	6:26893	NTIS, PC A02/MF A01. Order Number DE81024100, Distribution Category MN -86
CONF-810693-	(International conference on solid films and surfaces, College Park, MD, USA, 8-11 Jun 1981)	
1(Draft)	6:27457	NTIS, PC A02/MF A01. Order Number DE81024133, Distribution Category MN -25
CONF-810695-	(2. international conference on precision measurements and fundamental constants, Gaithersburg, MD, USA, Jun 1981)	
1	6:27915	NTIS, PC A02/MF A01. Order Number DE81024116, Distribution Category MN -34C

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CONF-810696-		(8. international thermal expansion symposium, Gaithersburg, MD, USA, Jun 1981)
1	6:27403	NTIS, PC A02/MF A01. Order Number DE81023163, Distribution Category MN -79p
CONF-810697-		(Towards superior energy management in refrigerated and frozen foods conference, Cincinnati, OH, USA, 30 Jun 1981)
1	6:27304	NTIS, PC A02/MF A01. Order Number DE81024115, Distribution Category MN -95d
CONF-810699-		(Society of Women Engineers 1981 national convention, Anaheim, CA, USA, 24-28 Jun 1981)
2	6:27160	*See* HEDL-SA-2314-FP
CONF-8106112-		(Workshop on pulsating B stars, Nice, France, 1-5 Jun 1981)
3	6:27831	*See* LA-UR-81-1909
CONF-8106118-		(4. symposium on neutron dosimetry, Neuherberg/ Munich, F.R. Germany, Jun 1981)
1	6:27755	*See* LA-UR-81-1683
CONF-8106119-		(Northwest regional American Chemical Society meeting, Bozeman, MT, USA, 17-19 Jun 1981)
1	6:26908	*See* RHO-SA-217
CONF-8106120-		(5. meeting of the international collaboration on advanced neutron sources, Julich, F.R. Germany, 22-26 Jun 1981)
1	6:27932	*See* LA-UR-81-1815
2	6:27573	*See* LA-UR-81-1817
CONF-8106121-		(Conference of the European Physics Society on nuclear and atomic physics with heavy ions, Bucharest, Romania, 9-12 Jun 1981)
1	6:27925	*See* LBL-12792
CONF-810706-		(Institute of Nuclear Materials Management conference, San Francisco, CA, USA, 13 Jul 1981)
8	6:26934	*See* MLM-2845-OP
10	6:27440	*See* LA-UR-81-1989
11	6:26933	*See* LA-UR-81-2024
12	6:26930	*See* LA-UR-81-1950
13	6:26931	*See* LA-UR-81-1961
14	6:26895	*See* LA-UR-1947
15	6:26936	*See* SAND-81-0585C
16	6:26932	*See* LA-UR-81-1964
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3	6:27552	*See* SAND-81-1579C
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1	6:27729	NTIS, PC A05/MF A01. Order Number DE81025176, Distribution Category MN -48
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6	6:28005	*See* UCRL-84904
13	6:27178	*See* SAND-81-0352C
14	6:27533	*See* LA-UR-81-374
36	6:27182	*See* UCRL-84887
38	6:28003	*See* UCRL-84874
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40	6:27139	*See* GA-A-16241
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50	6:27174	*See* LA-UR-81-1685
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1	6:27164	NTIS, PC A02/MF A01. Distribution Category MN -78
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6	6:27144	NTIS, PC A02/MF A01. Distribution Category MN -77
7	6:27149	*See* LA-UR-81-1937
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3	6:27996	*See* SAND-80-2788C
5	6:26923	*See* UCRL-85191
6	6:27535	*See* LA-UR-81-1045
9	6:27950	*See* SAND-80-2745C
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1	6:27177	*See* SAND-81-0322C
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3	6:27945	*See* LA-UR-81-941
4	6:27534	*See* LA-UR-81-937
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9	6:27131	*See* LBL-12451
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10	6:27630	*See* LA-UR-81-1944
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1902517	6:26847	San Mateo, CA; Pacific Coast Gas Association, Inc. (1979).
1903395	6:27217	Washington, DC; Appalachian Regional Commission (1981).
1903585	6:26856	Univ. of New Mexico, New Mexico Energy Inst., Albuquerque. Order Number DE81903585, Distribution Category MN -90c
1903610	6:27680	Washington, DC; Federal Emergency Management Agency (1981).
1903682	6:27336	London, England; Dept. of Industry (1981).
1903683	6:27337	London, England; Dept. of Industry (1981).
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4,248,730	6:27525	
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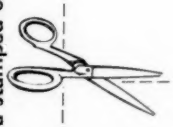

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